V.—THE LOFFODEN FISHERY IN 1880.*

By Lieut. NIELS JUEL.

The following report concerning the Loffoden fishery in 1880 was prepared for His Majesty the King, by Niels Juel, first lieutenant in the navy, chief inspector of that fishery:

The work of inspection continued from January 16 to April 14, over the region from Loffoden to Guldvigen. The force consisted of 8 officers, 1 inferior officer, 2 mates, 3 foremen, 21 seamen, and 1 cook. Its distribution is shown in the annexed Table I. The time of its arrival at Loffoden was as follows: January 16, the chief inspector and 2 men. January 18, 1 officer and 4 men. January 25, 3 officers and 20 men. February 1, 7 officers and all the men. February 3, the entire inspection force.

Since, at the close of the month of January this year, fewer boats than usual had arrived, only 1,800 against 3,100 in 1879, and 2,200 in 1878, no serious detriment followed from the small inspecting force at the beginning of the fishery. The inspecting party was not ordered to meet earlier simply because of the scantiness of the appropriation. It will at the same time be unfortunate if such an arrangement be established as a rule; the fact that there was no further injury to the preservation of order or the service in general this year was simply because of the circumstance that from the 20th of January to the end of the month there were only three days in which the weather allowed the fishermen to cross West Fjord. Because of the steamer's schedule, the chief inspector, together with the officers and men, departed on the 13th of April, with the exception of one officer, who remained at stations in Flakstad until the inspection closed at midnight on the 14th. The officers were employed on the average seventy-eight days, and the men eighty-six, or, if the traveling-days be excluded, seventy-nine days. The pay of the inspecting force amounted to 140 crowns ($37.52) daily. The average combined pay of the officers was 624 crowns ($167.23), and of the crew 185 crowns ($49.58).

* *Fra Opsynschefen ved Lofotfiskeriet. Lofotfiskeriet*, 1880. *Kristiania. Trykt hos Chr. Schibsted.* Translated by TARLETON H. BEAN.

NOTE.—It will be observed that the totals in some of the statistical tables cannot be obtained by adding their component parts. Whether this is due to omissions of minor details or to typographical errors cannot now be determined, and the original is reproduced without change.—TR.

TABLE I.—*Distribution of the inspecting force.*

Sign of the district.	Inspection district.	Fishing stations.	Extent in sea-miles.	Maximum fleet.			Officers' assistants.		Inspecting officer.	Surgeon.
				Vessels.	Boats.	Men.	Mates.	Sailors.		
B & C.	Skroven	Skroven, Gudbrandsö, Vikan, Brettesnæs, Guldvig, Skjoldvær.	2	70	700	3,600	.....	2	H. Kjelsberg	A. J. Sand (ward).
E, F, & S.	Svolvær	Östnæsfjord	2	*110	*700	*3,900	.....	2	Th. Wislöff	E. Rode, from March 20.
		Svolvær, Osan								
H & I.	Vaagene	Kirkevaag, Kabelvaag, Storvaagen	½	100	950	5,200	1	2	J. Vinnem	Chr. Eger (infirmary).
K, L, & M.	Hopen	Molnosen, Örsvaag, Örsnæs, Hopen, Kalle	⅓	90	720	3,800	1	2	M. Kjelsberg	U. F. M. Poppe (ward).
N.	Henningsvær	Guldvigen, Festvaag, Sauöen, Henningsvær	⅔	150	1,100	6,200	1	2	J. Tönseth	
P, G, & T.	Stamsund	Valberg, Skokkelvigöerne	1½	130	1,050	5,700	.....	3	H. Olsen	H. Kjelsberg (ward).
		Hartvaagen, Svarholt, Stamsund, Æsöen, Upper and Lower Stene.								
U.	Ure	Ure	¼	30	300	1,600	.....	.....	H. Jacobsen † (subordinate officer).	
V & W.	Balstad	Sandsund, Mortsund, Brandsholmene, Moholmene, Baarsund, Balstad, Krämmervigen.	1	40	400	2,200	1	2	A. Öiestad	D. F. Schumacher (district infirmary).
X, Y, Z, Æ, Ö, & H.	Sörvaagen	Stromsö, Nufsfjord, Inner and Outer Næsland, Sund, Havnö, Olenilsö, Reine, Moskenæs, Sörvaagen, Bogen, Tind, Åa, Evenstad.	3½	80	750	4,200	.....	2	J. J. Rokkonæss	H. Ommundsen (ward).
	"Lunnen"	Storvaagen, Östnæsfjord	.....	.....	.....	.....	1	2	.....	
	Svolvær	As servants to the chief inspector and judge, and assistants to the officer and manager.	.....	.....	.....	.....	.....	2	.....	
			.....	800	6,670	36,400	5	21		

*Not including Östnæsfjord. †In Östnæsfjord, from March 18 to 25.

In the report of last year, pages 5 to 9, as well as in the estimate for 1881, I set forth strongly the necessity of an increased appropriation, because the inspection force is at present inadequate for the increased labor of late years, partly because the wages are too solutely as well as relatively to the requirements which ought to ound in the personnel of the inspection, and in part because many expenses, such as hoisting signals, placing beacons, lodging for the men, together with printing the report, amounted to not a little. I cannot sufficiently insist upon it that the claim which has been made for an increased appropriation has not been called forth by a desire to make the inspection more absolutely effective, but it is based upon the necessity of taking such measures as will prevent its retrograding as an institution, and it is doing this now, because the increased number of people and the exigencies of the times demand a larger force as well as increased capability and activity in it. From Table II it will be seen that while the proportion between the inspecting force and the total number of fishermen, mariners, and other tradesmen was, from 1861 to 1862, as 1 to 500, it was in 1880 as 1 to 840.

Under the last two heads are given the cost of the inspection, which has always been set forth as so considerable, deducting what was paid into the treasury in the shape of fines or for telegrams. Herefrom it will be seen that this has been from .82 to 1.33 crowns (22 cents to 36 cents) for each adult male who has been present during the fishing. If one compares the expenses of the inspection with the other expenses during the fishery he will find out that last year the loss of implements was 83 times as great as the cost of inspection; the cost of bait was 10 times as great as the cost of inspection; the wear and tear of skin-clothing was 10 times as great as the cost of inspection; the wear and tear of bed-clothing was twice as great as the cost of inspection.

If we remember that the inspection, whose operations include vessels in Loffoden, together with the mercantile class in many parts of the country, never costs one-half as much as the wear and tear of the fishermen's bed-clothing may be estimated at, the sum of 23,000 crowns ($6,164) seems insignificant. In comparison with the duties its cost was nearly the same as the import duties upon the sugar and coffee which were consumed during the fishing, and a couple of thousand crowns ($536) less than the duties upon fish imported.

Some have thought that the inspecting party might facilitate its work by associating with it a voluntary inspection by the people similar to that established at Söndmöre by a law of June 6, 1878. The chief duty of this inspection shall, according to law, consist in "seeking by injunction and warning to prevent as far as possible" violation of law at sea. How far the public morals will be improved hereby is, however, doubtful, for it is not through ignorance or lack of warning that offenses are committed at sea, but because the fisherman knows that it is extremely difficult to get full proof of them. Even if information to the police be

made a duty of citizenship it still lacks the great essential to its promised utility, namely, the ability to procure conclusive proof; for this as a rule can be brought by the injured party alone, and often not by him. a thing of which the police records can furnish abundant examples. I cannot see that an inspection by the people, that is to say, organized in the manner proposed, can make any change in the existing state of things, because there is now just as little want of injunction and warning as of announcements. On the contrary, the result of it will probably be that when either a single trade or people from a particular district are present in a large majority in most of the stations they will tyrannize over those more weakly represented. So far as I have learned, the plan is based upon an opinion of certain people, but I think that where such is found it involves the idea of self-management, while in the legal method is found no trace of such an idea beyond the formal condition that there shall be a choice.

The inspection imposed in all 152 fines. The nature of the offenses is set forth in the annexed table III, which also contains a statement of the fines imposed by the inspection during the last five years. The number of fines this year is somewhat smaller than that of last year. The diminution occurs especially in transgressions of section 10, which is because of the fact that the fines were all imposed for individual infractions of one portion of that section; also in transgressions of section 11, which is for the reason that there was only one fishing-sea, and its limits were better known than last year when this division first took place.

The matter of making arrests (page 13 in the report for 1879) and of authority for sending vagrants to a house of correction (same report, pages 74 and 75) will probably be decided in the course of the year.

TABLE III.

Offenses.	Number of fines received or imposed.				
	1876.	1877.	1878.	1879.	1880.
Fines, total	334	*197	188	182	152
These consisted of:					
For disturbing the peace, § 6	17	24	36	25	32
For breaking the harbor regulations, § 7	.....	3	5	1	4
For fishing without boat-marks, § 9	9	2	6	2	3
For fishing too early or too late, § 10	213	104	55	99	65
For setting in unlawful waters, § 11	10	25	35	25	8
For sabbath breaking, § 12	.....	1	.....	.....	.....
For throwing out ballast, § 13	.....	.....	1	.....	1
For sailing in spite of warning, § 15	1	1	.....	.....	.....
For improper clearance, § 16	16	7	19	11	8
For sailing on a holiday, § 19	8	3	15	2	1
For improper treatment of rescued gear	2	.....	3	1	1
For violation of health regulations	31	2	.....	4	1
For unlawful sale of whisky	13	16	3	6	16
For unlawful sale of beer and wine	12	1	5	3	11
For unlawful sale of other articles	2	2	5	3	1
Fines received by amicable arrangement in private matters.	18	20	20	20	13
Private matters otherwise treated, which are on the record.	162	252	257	428	368

* Includes for shooting eider duck, 6.

The fines amounted to 2,224 crowns ($596.03), of which 1,126 ($301.77) fell to the state treasury, 549 ($147.13) to various local treasuries, and 549 ($147.13) to the inspecting force as their share.

By amicable adjustment in private affairs were received 13 fines, amounting in all to 144 crowns ($32.59), of which 66 ($17.69) went to the poor-fund, 2 ($0.54) to the reading-room in Stamsund, and 76 ($20.37) to the projected reading-room in Henningsvær.

The inspecting force investigated and put on the register 188 private cases concerning fishery business exclusively and also 180 other private disputes.

Law Candidate Marcus Hegge Parelius, an attorney of the superior court, acted as judge extraordinary. The number of cases for this year and the four immediately preceding it is stated in table IV below:

TABLE IV.

Cases.	Cases managed by the judges.				
	1876.	1877.	1878.	1879.	1880.
Total	33	28	29	35	49
Of these were:					
Examinations	16	19	15	21	18
Police cases	15	4	9	5	17
Declarations		1	2	3	3
Protests		2		1	2
Executions	2				2
Tax cases		1	2	3	2
Private disputes		1	1	2	5
Number of cases relating to:					
Theft	12	11	10	9	13
Fraud		1	1	4	
Concealing goods found	2	1	2	3	
Chapter 18 of criminal laws		2	1		
Other crimes	2	4	1	5	5

Of the five examinations included under "other offenses," four related to assault and one to opening letters. Of the examinations, 9 were decided and the rest closed. Of the police cases, three were adjudged and the rest settled after the fine was agreed upon. Two police cases were transferred for treatment outside the inspection district, since the parties concerned left before the judge found time to dispose of the cases. Of the cases before the special court, four were decided and one was settled after legal adjustment. Eleven public cases announced for the associate judge were sent to the superior court because time did not allow their treatment during the fishing season. Of these, seven related to theft and four to fraud. Of eight old cases which were sent from the superior court for continuation, time allowed the disposal of only one.

From the above it will be seen that the judge has disposed of more than one-half as many cases as the average of the four preceding years, four times as many as the average from 1872 to 1875 (see report for 1879, page 14), also nearly one-half as many as the two judges combined from 1860 to 1871. Eighteen examinations and two police cases, for lack of

time to dispose of them during the fishing, were sent over to the common court, to which, for the same reason, a not inconsiderable number of special-court cases were referred. The management of the examinations by the common court will cost much more to the public treasury than by the associate judge; the chief inspector for two years has proposed to act on the budget, and during the fishing this year applied for it. On account of these increased expenses for the criminal fund the superior magistrate in the district of Nordland, so far as I know, has undertaken to obtain, through the department of justice, the necessary judicial assistance during the fishery. If such help can be had in this way it will be unnecessary to apply for any associate judge until the fishing begins. In the contrary event I cannot sufficiently emphasize the necessity of appointing such a one as soon as the number of cases demands it, although there is no license.

A. J. Sand, director of inspection in the district of Skroven and Östnæsfjord, brought, as physicians, O. Ch. Chr. Eger, district physician in Vaagen and the rest of the districts of Svolvær, Vaagen, and Hopen, U. F. M. Poppe, of the medical corps of Henningsvær district, Medical Candidate H. Kjlesberg of the Ure and Stamsund districts, D. F. Schumacher, district physician in Buksnæs in the district of Balstad, and H. Ommundsen, district physician of Flakstad and its dependencies. From March 20 Medical Candidate E. Rode took charge for a week of the medical inspection in Svolvær district, and later of Hopen district also. From February 23 Ch. A. Sellæg, district physician in Ofoten, took charge of the medical inspection in Værö and Röst.

The table below shows the number of sick treated in the different medical districts:

Medical district.	Sick treated.		
	Total.	Of these are—	
		In the infirmary.	Dead.
Skroven	294	18	3
Svolvær	53	1	.....
Vaagene	856	127	9
Henningsvær	1,732	85	7
Stene	414	80	6
Balstad	355	52	5
Flakstad	392	13	1
Grand total	4,096	376	31

The number of patients in proportion to the fishermen, seamen, and other tradesmen present was larger than in any of the four preceding years, namely, 13.5 per cent. The number of cases of diarrhœa, chills and fever was greater than usual. The cases of chills may possibly in part be attributed to the want of proper house-room, since, on account of the overcrowding in many places, it was necessary to house the incoming fishermen in lofts and cow-houses (even pig-pens and summer cow-pens were not refused). The diarrhœa indeed had its origin partly

in the same condition, partly also in the want of suitable drinking-water. Of exanthematous typhus 2 cases occurred, and of typhoid fever 77, of which 8 ended fatally. There were 54 cases of inflammation of the lungs, with 5 deaths. The other causes of death were: Incarcerated hernia, 4; paralysis of the brain, 3; inflammation of the brain, 2; acute diarrhœa, 2; dropsy, 2; epidemic cerebro-spinal-meningitis, 1; rheumatic fever, 1; twisting of the gut, 1; senile inflammation, 1; and gangrene 1.

The table following shows the number of cases of nervous fever and lung-inflammation treated at the Loffoden fishery since 1860. Through the generosity of the medical office the returns are now complete for the whole time, and they are here given entire.

Year.	Totals.			Year.	Totals.		
	Nervous fever.	Inflammation of the lungs.	Deaths.		Nervous fever.	Inflammation of the lungs.	Deaths.
1860	21	19	13	1872	23	12	4
1861	12	20	23	1873†	54	18	19
1862	16	31	15	1874‡	146	17	13
1863	122	57	23	1875	56	18	
1864	102	34	15	1876	28	140	46
1865	83	19	9	1877	6	38	9
1866	26	16	13	1878	8	51	17
1867*	59	33	19	1879	55	38	15
1868	106	24	14	1880	72	54	31
1869	88	11	17				
1870	69	28	4	Average			15.9
1871	47	14	9				

*3 cases of variola. †6 cases of exanthemata. ‡1 case of exanthema.

Thus disease has claimed an average of 16 yearly, or 68.7 in 100,000, while the sea and accidents have taken off 25½, or 110 in 100,000. Of deaths there have occurred also during the Loffoden fishery through disease 1 for about every 1,500 of the population, through shipwreck 1 for every 900 men. Judging from statistics also, we must be prepared next year for a greater number of cases of nervous fever.

Venereal disease has increased, not only in the number of cases, but also in proportion to the fishing population. The inspection seeks in this matter, as far as possible, by controlling it, to prevent the spread of the plague, and next year it will also institute legal proceedings against any one who, being known to have this disease, communicates it to another.

The prevailing diseases have been:

Catarrh of the air-passages	481
Other acute catarrhal affections	216
Diarrhœa	450
Cardalgia and chronic gastritis	346
Swollen fingers	289
Wounds (*vulnera*)	226
Eye diseases	208
Simple fever	182
Chronic rheumatism	148

Nervous disorders	143
Boils, abscesses	139
Bruises and sprains	131
Senile inflammation	74
Total	3,033

Or three-fourths of all the sick treated.

Table V below shows the proportion, for the last five years, which the prevailing diseases have borne to the size of the fishing population. On the average there have been treated yearly:

For cardalgia and chronic gastritis, 12 in every 1,000 men.

For catarrh, 18 in every 1,000 men.

For diarrhœa, 10 in every 1,000 men.

For swollen fingers, 9 in every 1,000 men.

For wounds (*vulnera*), 6 in every 1,000 men.

For chronic rheumatism, 6 in every 1,000 men.

The difference has been greatest in the cases treated for catarrh of the air-passages, namely, from 6 to 16 in 1,000. The number of swollen fingers was smallest in 1878, which was due in part to the fact that the number of line-fishermen was smaller that year than in the others, but when compared with the two preceding years it must of course be attributed principally to the attention paid to the need of speedy treatment of the cuts which produce the inflammation; and when 1878 is compared with the two following years, it appears as if the so-called wound-varnish, whose distribution was opposed by all the doctors, has played an important part in securing the low number of this and a part of the following year. If we compare the number of swollen fingers with the number of line-fishermen, who are most afflicted by them, we shall see that there were, in 1876, 29 cases to every 1,000 line-fishermen; in 1877, 26 cases to every 1,000 line-fishermen; in 1878, 20 cases to every 1,000 line-fishermen; in 1879, 23 cases to every 1,000 line-fishermen; and in 1880, 28 cases to every 1,000 line-fishermen.

I think, therefore, that the attention not only of the fishermen, but also of the chemists, should be urgently directed to this important matter, since the wound-dressing which the royal apothecary, Ditten, distributed gratis in 1878 and part of 1879 was not entirely satisfactory.

TABLE V.

Prevailing diseases.	1876.	1877.	1878.	1879.	1880.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Cardalgia and chronic gastritis	1.2	1.0	1.3	1.5	1.1
Bronchial catarrh	1.6	0.6	0.9	1.2	1.5
Other catarrhal affections	0.7	0.6	0.6	0.5	0.7
Inflammation of the lungs	0.6	0.2	0.2	0.1	0.2
Diarrhœa	0.6	0.6	1.6	1.0	1.4
Eye disease	0.4	0.6	0.6	0.7	0.7
Nervous disease	0.5	0.4	0.7	0.7	0.5
Swollen finger	1.1	1.0	0.6	0.7	0.9
Chronic rheumatism	0.6	0.9	0.6	0.5	0.5
Wounds (*vulnera*)	0.5	0.5	0.6	0.5	0.7
Senile inflammation		0.2	0.5	0.2	0.2
Treated in all	12.2	11.0	12.0	12.8	13.5

Cases of sickness each month.

Medical district.	Cases treated.				
	January.	February.	March.	April.	Total.
Skroven	13	120	131	30	294
Svolvær			53		53
Vaagene	24	247	413	172	856
Henningsvær	155	685	748	144	1,732
Stene	14	148	201	51	414
Balstad	27	133	142	53	355
Flakstad	28	83	163	118	392
Væro and Röst					44
Total	261	1,416	1,851	568	4,140
		4,096			

Væro and Röst do not belong to the inspection district. As will be seen, the physician in Svolvær, during the single week of his practice there, had more patients than the doctor at Væro and Röst in the space of seven to eight weeks. Under ordinary circumstances the medical attendance during the Loffoden fishery is sufficient, except in Vaagen, during the East Loffoden fishing, when it will be desirable to have two physicians present from the middle of February to the close of March. (See report for 1879, page 16.) The table below shows the number of sick treated in the hospitals. In the middle of March these were inspected by the director of the civil medical department:

Hospital.	Hospital patients.				
	January.	February.	March.	April.	Total.
Skroven		9	8	1	18
Kabelvaag					128
Henningsvær	6	36	39	4	85
Stene		26	43	11	80
Gravdal	3	13	25	11	52
Reine		4	7	2	13
Total					376

Altogether 9.2 per cent., or one-eleventh, of the sick were placed in the hospital.

For the remaining details of this subject I venture to present the annexed Table VI, which contains a statement of the cases of sickness treated by the doctors. This, as well as the two preceding tables, was kindly prepared by the medical office:

TABLE VI.—*Summary of the cases treated by the physicians during the Lofoden fishery*, 1880.

	Total.	
	Treated.	Died.
Exanthem, typhus	2	
Typhoid fever	77	8
Cerebro-spinal meningitis, epidemic	1	1
Simple fever	182	
Chicken pox	5	
Scarlet fever	1	
Erysipelas	1	
Diphtheritic inflammation of throat	4	
Kusma	22	
Bronchial catarrh	487	
Other acute catarrhal affections	221	
Inflammation of lungs	54	5
Pleurisy	31	
Chronic bronchitis, asthma	33	
Spitting of blood	6	
Consumption	9	
Heart disease, palpitation	12	
Ague	1	
Rheumatic fever	47	1
Chronic rheumatism	148	
Muscular rheumatism, contracted at sea	15	
Sting (stitch?)	72	
Acute diarrhœa	450	2
Other acute affections of the digestive apparatus	56	1
Cardalgia, chronic gastritis	348	
Scurvy	1	
Brain fever	2	2
Nervous disorders	144	3
Mental diseases	3	
Dropsy, *Morbus Brighti*	5	2
Disease of urinary organs	14	
Skin disease	92	
Worms	4	
Syphilis	5	
Gonorrhœa, urethritis	28	
Epididymitis, orchitis	21	
Wounds (*vulnera*)	233	
Fractures and luxations	13	
Bruises and sprains	134	
Senile inflammation, *vakrom*	74	1
Disease of bones and joints	66	
Lymfangit, phlebitis	5	
Swollen fingers	297	
Boils, abscesses, ulcers	139	
Furuncles, carbuncles	57	
Gangrene	1	1
Burns	19	
Frostbites	36	
Eye diseases	213	
Ear diseases	75	
Nasal affections, epistaxis	11	
Tumors	10	
Rupture	25	4
Diseases not indicated	116	
Other affections	12	
Total	4,140	31
Teeth extracted	116	
Number of hospital cases	376	

The county council of Nordland last year placed at the disposal of the superior magistrate of that district the necessary funds for improving the management of the water supply, and the county also will hereafter pay interest on the money borrowed from the medical fund (18,800 crowns—$5,038.40—in 1878). Moreover, I think it proper to call attention to the sums which are supplied from the medical fund for the expenses of the council incurred for vaccination, midwifery, and treatment of mental disorders.

For extraordinary clerical service during the fishery, were present O. S. Revers and L. A. Meek, assistant diocesan clergymen.

S. Nilssen, parish clerk of Melö, taught school forty-four days in Stamsund. The number of pupils was upwards of 60, most of them from Stegen and Lenvig. The course of study was the same as last year. The school-day, as a rule, was four hours. In Henningsvær school was established also, but the attendance was small. Since education is not compulsory, the patronage depends largely on the interest which the teachers can awaken in the school. On account of the not inconsiderable number of boys who are present during the Loffoden fishery, without taking any direct part in it, I think that a modification of the system of instruction for the fishing season is worthy of closer consideration. The time of these boys, to be sure, is partly occupied in baiting lines, cleaning, and cooking; but still a portion of them remain in idleness. The matter must, however, rest until we learn their number, and I shall undertake an enumeration next year.

There are chapels now in Svolvær, Vaagen, Hopen, and Stamsund, whilst in Ure one is being constructed. Churches are found in Kirkevaag, Henningsvær, Valberg, Stene, Gravdal, and Moskenæs. The following table gives the expenses of the chapels, the contributions by which they are erected, and also their debt:

Chapels.

Place.	Cost.	Contribution—		Debt.
		From the state.	Private.	
	Crowns.	*Crowns.*	*Crowns.*	*Crowns.*
Svolvær	4,400	2,500	1,900	.....
Vaagene	2,000	.....	2,000	.....
Hopen	2,500	.....	2,500	650
Stamsund	9,200	2,000	6,100	1,100
Ure	3,200	.....	800	2,407

As a building fund for proposed chapels was collected: In Skroven, 1,700 crowns ($455.60); in Balstad, 140 crowns ($37.52); and in Nufsfjord, 300 crowns ($80.40).

There is at present one reading room (in Stamsund). One is being built in Ure, and in Henningsvær 1,200 crowns ($321.60) have been collected for a prospective reading room.

Libraries are to be found in Henningsvær, Stamsund, and Svolvær. In the last two places, however, the number of books is yet very small. In 1878 the county council of Nordland granted to each hospital 50 crowns ($13.40) from the medical fund for the purchase of books. In 1879 the grant was extended also to the wards in Loffoden. It is very desirable to repeat this grant for many years to come, in which case, however, I think it is proper to advise that the purchase of books be

made according to a fixed plan, such as that established by direction of the diocese.

From the foregoing it would seem evident that there is a want of houses of worship in the larger places as well as in those more remote which are destitute of churches, since there are at present only five built and three projected. As the financial condition of the common people at present is discouraging, partly on account of low prices last year in Lofloden, and in part because of the unsuccessful herring fishery, and as we cannot expect to find among fishermen who move quickly from one place to another the same social spirit as in a settled community, there exists a state of financial depression in nearly all the churches. Here is, therefore, a proper object of public assistance. The want is greatest in Skroven, where as many as 3,000 people can often be assembled, and where all divine service hitherto has of necessity been held in the open air. Next in want is Nufsfjord, whose annual complement is nearly 400 men, and from which the distances to church are both long and troublesome. In this connection I think it proper to add that it will certainly be most prudent to make the contribution from the state contingent upon public control over the use of the chapels, which has not been the case hitherto.

Libraries have come to be appreciated of late, and their utility is incontestable. That they have not become general is principally because only a few places have taken the initiative in this matter. Not only should money be collected, but building should be entered upon, and the house once finished should be, during its use in the fishing-season, cared for by heating, lighting, and cleaning it as well as by providing newspapers and books. The fisherman, because of his occupation, cannot easily furnish anything except money. At the same time it certainly is essential that these libraries be subject to a wise control, for they may easily degenerate and become an injury instead of a source of use and comfort. I find this matter of such importance both for the fishermen and the public that I believe I should call attention to it, since the idea is a sound one, though it will hardly be initiated by the fisherman himself, and since unity in action will accomplish the end more quickly and surely.

The telegraph corps consisted of 23 operators, divided among 9 fixed and 3 field stations. On account of the fishing, the force at Lödingen station was augmented during the fishing-season by 2 operators. Of the 9 fixed stations the following 5 are open throughout the year: Svolvær, Vaagen, Henningsvær, Balstad, and Sörvaagen. Of the remaining stations the field station in Stene is closed on the 14th of April, and the stations in Skroven, Hopen, Ure, and Reine close April 30 after the service ends. Stamsund station is kept in operation later. During the fishing the Digermul field station is moved to Vaterfjord (Östnæsfjord) on March 15, and on the 30th from there to Stene, where it is opened on the 2d of April.

Table VII shows the number of telegrams sent and received at the above-named 12 stations between January 1 and April 30. The statement is a summary kindly communicated by J. B. Lie, inspector in the district of Tromsö:

TABLE VII.

Stations.	Distance in Norwegian miles.	Number of telegrams dispatched from January 1 to April 30.									
		January.		February.		March.		April.		Total.	
		Sent.	Received.	Sent.	Received.	Sent.	Received.	Sent.	Received.	1880.	1879.
Digermulen	0	18	17	20	24	138	116	93	62	488	147
Skroven	3	30	28	342	193	874	541	245	185	2,438	2,087
Svolvær	¼	351	266	708	448	1,594	1,084	641	487	5,579	4,316
Vaagen	¼	327	212	961	539	1,690	1,080	819	539	6,167	6,032
Hopen	¼	74	46	475	181	477	352	188	120	1,913	2,011
Henningsvær	¼	271	197	776	474	1,050	949	559	371	4,647	5,626
Stamsund	1½	184	109	700	374	1,112	1,096	320	284	4,179	3,530
Ure	¾	25	13	95	76	239	243	84	70	845	651
Balstad	½	236	144	345	188	614	425	378	278	2,608	2,259
Sund	1½	21	25	126	97	302	263	267	200	1,301	1,132
Reine	1	35	16	95	83	215	218	198	173	1,033	1,011
Sörvaagen	¾	55	58	218	116	265	197	247	185	1,341	1,398
		1,627	1,131	4,861	2,793	8,570	6,564	4,039	2,954	32,539	30,200
		2,758		7,654		15,134		6,993		+ 2,339	

For comparison the number of telegrams dispatched during the fishing-season in the last three years is appended:

Month.	Number of telegrams.		
	1878.	1879.	1880.
January	3,472	2,710	2,758
February	7,893	5,463	7,654
March	11,703	13,244	15,134
April	7,132	8,795	6,993
Total	30,200	30,212	32,539

The number of telegrams exceeds that of last year by 2,300. The increase is marked at stations in East Loffoden, and, as to time, during the month of March.

In my report for 1878, as well as in that of 1879, I stated that the number of lines was too small for the amount of correspondence, a view which was shared by the telegraph department, which therefore in both of these years solicited Parliament for the necessary license to establish a new wire between Ure and Henningsvær, but in vain. I must therefore this year again emphasize the necessity of this line, for under existing circumstances the detention of messages, which is essentially due to the want of a sufficient number of wires, is frequently highly perceptible and has occasioned considerable loss of both time and money.

At any rate the number of lines is far from adequate to the amount of correspondence, a condition which should in justice be secured for a business so important to the country.

The table following shows the number of telegrams sent and received annually from 1870:

Year.	Telegrams.			Permanent stations.	
	Sent.	Received.	Total.	Number.	Open all the year.
1870	10,000	7,800	17,800	8	2
1871	10,300	7,500	17,800	.....	.....
1872	11,600	7,600	19,200	.....	.....
1873	12,800	9,000	21,800	.....	.....
1874	14,800	10,900	25,700	.....	.....
1875	17,700	12,400	30,100	.....	.....
1876	22,100	16,600	38,700	.....	.....
1877	26,200	18,600	44,800	.....	.....
1878	24,200	17,500	41,700	9	5

From January 16 to April 14, 90 days, Loffoden has been called at by 114 line steamers besides local vessels. Of these there were—

Northward bound.

Packets *en route* from—	
Bergen to Hammerfest	4
Bergen to Vadsö	2
Hamburg to Vadsö	7
Kristiania to Tromsö	14
Total	27
Private vessels between—	
Bergen and Tromsö	10
Bergen and Vardö	4
Bergen and Vesteraalen	9
Bergen and Loffoden	2
Kristiania and Vardö	1
Loffoden and Vardö	3
Total	29

Southward bound.

Packets between—	
Hammerfest and Bergen	3
Hammerfest and Hamburg	5
Vadsö and Hamburg	7
Tromsö and Kristiania	13
Total	28

Private vessels between—

Tromsö and Bergen	11
Vardö and Bergen	3
Vesteraalen and Bergen	10
Loffoden and Bergen	2
Vardö and Kristiania	1
Vardö and Loffoden	3
Total	30

Of the 27 north-bound packets 14 were delayed from one-half day to three days, as follows: 5 times, one-half day; 4 times, one day; 1 time, one and one-half days; 3 times, two and one-half days; and 1 time, three days.

In January occurred 4 detentions; in February, 6, and in the first half of March, 4.

Of the 19 packets, which in this space of time called at Loffoden, going north, 14 also were detained, or, if we overlook delays of a half day, 9 (one-half). The cause of these detentions was stated to be storms and fog. But since, at the season mentioned, one can never calculate on continuous good and clear weather, or on moonlight, the real reason must be sought for in the routes, which are established for speed; besides, I think that to make the service adequate it will be necessary to put one more vessel in commission. This will cause the steamship company concerned, or the state, an increased outlay. The results of the delays of the packets are felt at present not only in the principal route, but also in its numerous branches in the fjords and out to the sea-islands; and if we take into consideration the inconveniences which are associated with a sojourn at the calling-stations, where there may often be a want of accommodation, and where one must often keep a constant lookout because he cannot tell when the delayed steamer may arrive, as also the waste of time each delay causes, the saving or the occasional speed one may reach by a forced route will hardly counterbalance the indirect tax which this, through the above-named conditions, puts upon the population of Nordland and Tromsö. I must therefore this year also emphasize the universal, and, according to my judgment, rightful desire for a more regular steamer service.

The matter of the pay of country postmasters, according to information obtained, will be adjusted by the marine and mail department of the Royal Norwegian Government at the beginning of the fiscal year.

In 1879, 4 beacons were erected and 20 moorings for vessels were placed within the inspection district.

Up to and including 1875 were found in the inspection district 8 light-houses, 7 beacons, and 407 moorings; in 1876 were established 5 beacons; in 1877, 6 beacons, 22 moorings; in 1878, 11 beacons, 12 moorings; in 1879, 4 beacons, 20 moorings. Total at end of 1879, 8 light-houses, 33 beacons, and 461 moorings on a coast stretch of 14 (Norwegian) miles.

When the work proposed by the chief inspector this year is accomplished, and this will probably require a couple of years, the number of beacons and moorings may be considered sufficient. The proposed fixing of rings I have not been able in many places to recommend, since, in the case where a vessel lies moored for a long time, bow and stern, and this forms the majority as a rule, I regard it a matter of vital importance for a vessel to establish the mooring in a convenient place ashore, especially as this work can be accomplished with ease and with moderate expense. With two rings, a drill, and a hammer, a mooring may be placed in one hour, or at the most two hours, and I should regard it a wise precaution if the insurance companies require that these articles form a part of every vessel's outfit.

Last year Gloppen light (Sörvaagen) was changed from the sixth to the third class. Thereby Balstad light has become less important as a range light for West Fjord, and since it will also be more useful as a guiding light to Balstad, the light-house board has taken into consideration the question of its removal.

The appropriation of 27,900 crowns ($7,477.20) for inspection during the fiscal year will probably be spent. At the same time, of this amount will be returned to the public treasury: Fines, 1,126 crowns ($301.77); for telegrams, 3,200 crowns ($857.60).

The appropriation of 1,200 crowns ($321.60) for extraordinary expenses of inspection in Rast Sound was not used.

The implements saved and not required during the fishing are preserved in Svolvær and Sund. The disbursements amounted to 656.26 crowns ($167.57), exclusive of the pay of the inspecting force, and the receipts were 1,195.75 crowns ($320.46), of which 935.45 crowns ($250.70) arose from auction sales of implements saved over from last year.

The correspondence-record of the chief inspector shows, for the term, 1,610 outgoing and 870 incoming issues, including telegrams. The office work, which is done exclusively by the chief of inspection, is thus considerable. Besides, the chief inspector is accountant as well as writer of responses which are made in fishery matters to the Government, as well as to private individuals, (partly also in affairs which lie outside of the domain of the Loffoden fishery), involving much labor.

As I pass on to the report of the fishing itself and its progress, I may remark that the statistical data are repeated in most cases for the last 5 years, in order that the administration, scientists, legislators, fishermen, and merchants may have the summary needed; for a report which deals exclusively with a single year's fishing, and which is published a long while after the end of the fishery, will be valuable only historically. Although I have labored towards this end for the space of 5 years, the report will not, until 1881, take the form which I think it ought to have in order to be useful. I have, for instance, in prosecuting this work during the year, been able to dispose of the months of October, November, and December only.

The arrival of the fishermen was delayed by stormy weather in the

last third of January and the beginning of February. On the first of February, consequently, not more than one-third of the fleet was present. The majority arrived between the 8th and the 14th, at which latter date not quite two-thirds had come out. At the close of the following week the fleet was assembled. Those which arrived late were partly deep-water fishermen, partly fishermen from neighboring districts, who went to Loffoden for the sake of the Östnæsfjord fishing, and partly fishermen who had previously carried on winter fishing in home waters.

The Finmark fishermen, as usual, begun to clear at the end of March; however, because of the fear of low prices, fewer than common were destined at first for Finmark waters. The cessation of the fishing in Östnæsfjord before Easter, and in East Loffoden immediately after, soon gave an opportunity for a general break-up in the first 8 days of April, after which time scarcely a single foreigner was fishing east of Balstad. Westward, nearly 1,000 boats were engaged.

Table VIII shows the number of boats which were present in the different inspection districts at the close of each week. For the weeks ending February 14 and March 20 there is given besides a special statement for the different methods, wherefrom it will be seen that nine-tenths of the line fishermen had come in the middle of February, against only a little over seven-tenths of the net fishermen; whereas the opposite proportion existed last year. Of the deep-water fishermen, as usual, only a little more than one-half had arrived.

Moving (shifting berth) during the fishery occurred to a greater extent in the latter half of February from East to West Loffoden, where, however, some were obliged to sail as far west as Reine for want of house room in the remaining stations; in the first half of March, also, they moved from Ure, Stamsund, Henningsvær, and a part of Hopen, to the more easterly stations and to Östnæsfjord.

TABLE VIII.

Week ending—	Raftsund.	Östnæsfjord.	Skroven.	Svolvær.	Vaagone.	Hopen.	Henningsvær.	Stamsund.	Ure.	Balstad.	Reine.	Sörvaagen.	Total.
January 17	8	.....	.....	.....	.....	120	.....	70	.....	112	.....	.....	900
January 24	.....	.....	40	25	25	160	400	160	.....	120	150	120	1,200
January 31	.....	.....	50	35	120	250	530	200	60	260	165	130	1,800
February 7	.....	.....	110	40	280	300	650	350	70	.....	170	.....	2,360
February 14	.....	115	315	225	690	590	1,000	500	125	380	230	275	4,445
Netters	.....	15	115	63	360	220	410	330	25	40	70	35	1,683
Liners	.....	100	94	127	80	270	400	130	100	340	160	240	2,041
Deep water	.....	.....	106	35	250	100	190	40	.....	.....	.....	.....	721
February 21	.....	90	430	380	830	680	1,040	670	170	340	560		5,190
February 28	.....	30	440	300	860	.....	1,050	780	190	.....	580		5,250
March 6	.....	.....	170	110	620	670	1,100	1,050	300	400	450	400	5,270
March 13	.....	150	300	550	800	720	1,070	900	220	380	640		5,730
March 20	.....	400	700	700	950	460	770	600	160	360	650		5,750
Netters	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,209
Liners	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,358
Deep water	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,183
March 27	.....	.....	600	620	950	520	810	400	170	350	650		5,070
April 3	.....	.....	350	300	900	500	750	450	150	.....	.....	.....	4,410
April 10	.....	.....	100	20	200	90	450	100	80	340	720		2,100
April 14	100									1,000			1,100

Table IX states the number of boats present at the close of each half-month during the last 5 years. In the table also is given the time of the Easter holiday, from which it will appear that it has had less to do with the departure of the fishermen than persons generally are disposed to think it has.

TABLE IX.

Time.	Number of boats present.				
	1876.	1877.	1878.	1879.	1880.
Middle of January	----------	600	300	700	900
Beginning of February	2,000	1,800	2,200	3,100	1,800
Middle of February	3,800	3,200	3,000	4,200	4,450
Beginning of March	4,700	3,800	4,100	5,000	5,250
Middle of March	4,910	4,570	4,700	5,280	5,750
End of March	3,100	4,400	4,700	4,800	4,400
End of first week in April	1,700	4,000	3,000	3,100	2,100
First day of Easter	April 16.	April 1.	April 21.	April 13.	March 28.

Table X is a statement of the number of sailors engaged up to March 16, their nativity and distribution with regard to the different kinds of gear, also the number of servants. As usual, the majority of the night-line fishermen in East Loffoden became day-line fishermen in March; just as many of the deep-bait men employed lines after their arrival at Loffoden.

TABLE X.

District.	Net.				Trawl-line.			Deep bait (hand-line).			Total number.			
									Boats.					
	Men.	Boatmen.	Boats.	Net boats having lines.	Men.	Boatmen.	Boats.	Men.	With lines.	Without lines.	Fishermen.	Boatmen.	Boats.	Servants.
Stavanger County: Soggendal, Hangesund	5	1	1	.....	3	1	1	3	.....	1	11	3	3	.....
S. Bergenhus County: Sund	.....	.....	.....	.....	.....	.....	.....	2	1	.....	2	1	1	.....
N. Bergenhus County: Bergen, Davigen, Selö	.....	.....	.....	.....	16	4	4	2	.....	1	18	5	5	.....
Romsdal County: Aalesund, Örskoug, Molde, Eid, Gryten, Christiansund	.....	.....	.....	.....	7	2	2	25	1	8	32	11	11	1
S. Trondhjem County: Trondhjem, Örkedalen, Hitteren, Hevne, Stadsbygden, Rissen, Örlandet, Bjugn, Aafjord, Björnör	596	109	110	1	18	5	5	727	11	209	1,341	334	335	145
N. Trondhjem County: Leksvigen, Stördalen, Værdalen, Stenkjær, Ytteröen, Inderöen, Sparbu, Stod, Beitstaden, Namsos, Fosnæs, Fladanger, Nærö, Kolvereid, Lekö	399	65	65	.....	35	9	9	440	5	148	874	227	227	79
S. Helgeland Bailiwick: Bindalen, Brönö, Velfjorden, Vegö, Alstahaug, Stamnæs, Herö, Tjötö, Vefsen	2,247	378	390	59	1,485	329	332	908	18	314	4,640	1,039	1,054	1,072
N. Helgeland Bailiwick: Mo, Hemnæs, Næsne, Dönnæs Lurö, Lödö, Melö	2,063	333	337	.....	140	31	31	259	8	81	2,462	453	457	670
Salten Bailiwick: Gildeskall, Beieren, Saltdalen, Bodö City, Bodö Parish, Skjerstad, Folden, Kjerringö, Stegen, Hammerö, Lödingen, Tysfjorden, Ofoten	3,475	569	619	62	2,386	545	598	387	49	90	6,248	1,253	1,356	692
Lofoten and Vesteraalen Bailiwick: Hadsel, Sortland, Bö, Dverberg, Flakstad, Buksnæs, Borge, Balberg, Vaagen, Gimsö	1,688	274	396	127	2,691	844	977	112	17	26	5,491	1,101	1,416	1,649
Nordland County: Kvædfjord, Ibestad, Trondenæs, Sand, Tranö, Dyrö, Maalselven, Lenvig, Hillesö, Berg, Balsfjorden	9,473	1,554	1,742	248	7,702	1,749	1,938	1,666	92	511	18,841	3,906	4,283	3,993
Tromsö County: Malangen, Tromsö Sound, Tromsö, Lyngen, Karlsö, Skjervö	2,975	480	486	3	2,502	585	592	618	109	85	6,095	1,259	1,272	196
Finmark County: Hammerfest Parish, Tanen, Vardö	.....	.....	.....	.....	9	3	3	9	2	2	18	7	7	.....

RECAPITULATION.

Stavanger District	5	1	1	.....	3	1	1	3	.....	1	11	3	3	.....
S. Bergenhus District	.....	.....	.....	.....	.....	.....	.....	2	1	.....	2	1	1	.....
N. Bergenhus District	.....	.....	.....	.....	16	4	4	2	.....	1	18	5	5	.....

| | | |

The total number of fishermen was 27,232, representing 5,753 crews, which is the largest force recorded in Loffoden. Compared with last year the increase is 1,676 men, or 471 crews; and, as compared with 1872, when the fleet was the smallest, 10,459 men, representing 2,107 crews, or 58 per cent.

Table XI gives the number of fishermen from the different parishes for the last five years, as well as the relative proportions in the parishes.

TABLE XI.

Year.	Number of native fishermen.													
	South Trondhjem District.		North Trondhjem District.		South Helgeland Parish.		North Helgeland Parish.		Salten Parish.		Loffoden and Vesteraalen Parish.		Tromsö District.	
	Men.	Per cent.	Men.	Per cent.	Men.	Per cent.	Men.	Per cent.	Men.	Per cent.	Men.	Per cent.	Men.	Per cent.
1876	577	3	360	2	3,586	17	2,104	10	5,213	24	4,438	21	5,005	24
1877	619	....	390	....	3,747	18	2,126	....	5,110	....	4,464	....	4,778	22
1878	785	....	421	....	4,015	....	2,440	11	5,470	....	4,391	19	5,137	23
1879	1,200	5	601	..	4,330	17	2,662	10	6,023	....	4,798	....	5,867	....
1880	1,341	....	874	3	4,640	..	2,462	9	6,248	23	5,491	20	6,095	22
Increase in 5 years	764	132	514	143	1,054	29	358	17	1,035	20	1,053	24	1,090	22
Increase over last year.	141	....	273	....	310	....	200	....	225	....	693	..	228	....

The mass of the Loffoden fishermen (23 per cent.) are from Salten and from Senjen and Tromsö, 22 per cent. Next come Loffoden and Vesteraalen with 20 per cent., South Helgeland with 17 per cent., North Helgeland with 9 per cent., and, finally, the two Trondhjem counties with 8 per cent. jointly. This proportion has been kept comparatively unchanged of late years. In the beginning of the sixties, on the contrary, 14 to 16 per cent. of the Loffoden fleet was from Northern Helgeland, and only 15 to 17 per cent. from Loffoden and Vesteraalen. The increase, so far as Loffoden and Vesteraalen are concerned, is caused partly by a larger ratio of hired men in Flakstad and Buksnæs, partly by a considerably increased fishing fleet from Hadsel. The decrease from North Helgeland is due chiefly to Næsne and Rödö, whose fleets now carry on fishing from home stations to a greater extent than formerly.

For five years the increase of fishing at Loffoden has been greatest from the Trondhjem counties, reaching 132 and 143 per cent.; next from South Helgeland, 29 per cent. From the remaining bailiwicks the growth has been about 20 per cent.

In Table XII are named the districts from which the Loffoden fleet has been increased by over 50 men or diminished by more than 15 since last year. It will be seen that there has been a gain in nearly 74 per cent. of the districts.

TABLE XII.

Parish.	From 1879. Men.	
	Increase.	Decrease.
Statsbygden	67	
Nærö	92	
Kolvereid	59	
Lekö	51	
Brönö	156	
Alstahoug	53	
Mo		33
Næsne		85
Lurö		47
Hadsel	85	
Sortland	90	
Buksnæs	202	
Vaagen	267	
Bodö		39
Folden	56	
Hammerö	65	
Lödingen	70	
Kvædfjord	69	
Ibestad	107	
Trondenæs		93
Sand	50	
Lenvig		76
Balsfjorden		32
Lyngen	110	
Total	1,649	405

Table XIII states the relations of the different modes of fishing during the last five years. Compared with last year, net-fishing has diminished and line-fishing increased, a result of the poorer net-fishery last year.

TABLE XIII.

Year.	Percentage of fishermen.		
	Netters.	Trawl-line fishermen.	Deep-bait men (hand-lines).
1876	43	45	12
1877	50	41	9
1878	58	32	10
1879	56	33	11
1880	49	38	13

Table XIV shows the ratio for the different districts. In five years the number of netters has varied as follows:

In South Helgeland, between 41 and 55 per cent., or 14 per cent.

In North Helgeland, between 77 and 89 per cent., or 12 per cent.

In Salten, between 51 and 63 per cent., or 12 per cent.

In Loffoden and Vesteraalen, between 20 and 44 per cent., or 24 per cent.

In Senjen and Tromsö, between 44 and 57 per cent., or 13 per cent.

In the first two years of the five-year period this method increased, and in the last two it fell off. By next year it will probably increase

somewhat again. The great difference between Loffoden and Vesteraalen districts, their proportion being double that of the others, is owing to the fact that net-fishing gradually decreased from 65 per cent. in 1862 to 9 per cent. in 1870. Later, in 1874, it advanced to 33 per cent., but in the following year it again fell off to 22 per cent.

TABLE XIV.—*Percentage of the population.*

Year.	MODE OF FISHING.																				
	South Trondhjem.			North Trondhjem.			South Helgeland.			North Helgeland.			Salten.			Loffoden and Vesteraalen.			Senjen and Tromsö.		
	Net-fishermen.	Line.	Trawl.	Net.	Line.	Trawl.	Net.	Line.	Trawl.	Net.	Line.	Trawl.	Net.	Line.	Trawl.	Net.	Line.	Trawl.	Net.	Line.	Trawl.
1862..	20	...	80	32	1	67	78	7	15	89	5	6	65	27	8	46	51	3	65	31	4
1870..	17	6	77	21	5	74	38	39	23	69	18	13	33	63	4	9	90	1	37	58	5
1876..	45	5	50	50	1	49	41	38	21	77	8	15	51	44	5	20	79	...	44	44	12
1877..	49	...	51	....	7	43	47	36	17	83	6	11	59	37	4	25	74	....	51	43	6
1878..	52	1	47	57	5	38	52	32	16	88	3	9	63	32	5	44	55.5	0.5	57	32	11
1879..	46	2	52	58	4	....	55	30	15	89	4	7	61	...	7	38	61	1	54	38	8
1880..	44.5	1	54.5	46	...	50	48	32	20	84	5.5	10.5	56	38	6	31	67	2	49	41	10

Table XV, following, shows the changes in the use of the various methods during the last twenty-one years.

In all Loffoden net-fishing has varied between 34 and 66 per cent., or 32 per cent.; line-fishing has varied between 21 and 55 per cent., or 34 per cent.; deep-bait fishing has varied from 8 to 14 per cent., or 6 per cent.

The variation in net-fishing was as follows: In South Helgeland from 38 to 79 per cent., or 41 per cent.; in North Helgeland from 69 to 90 per cent., or 21 per cent.; in Salten from 33 to 65 per cent., or 32 per cent.; in Loffoden and Vesteraalen from 9 to 49 per cent., or 40 per cent.; in Senjen and Tromsö from 33 to 65 per cent., or 32 per cent.

The variation in trawl-line fishing was: In South Helgeland from 4 to 43 per cent., or 39 per cent.; in North Helgeland from 3 to 19 per cent., or 16 per cent.; in Salten from 25 to 63 per cent., or 38 per cent.; in Loffoden and Vesteraalen from 49 to 90 per cent., or 41 per cent.; in Senjen and Tromsö from 29 to 60 per cent., or 31 per cent.

Deep-bait fishing with hand lines has varied: In South Helgeland between 13 and 24 per cent., or 11 per cent.; in North Helgeland between 3 and 15 per cent., or 12 per cent.; in Salten between 3 and 12 per cent., or 9 per cent.; in Loffoden and Vesteraalen between ½ and 4 per cent., or 3½ per cent.; in Senjen and Tromsö between 4 and 14 per cent., or 10 per cent.

A regularity in this change from one method to another, which promises to become permanent, has been observed only in the two Trondhjem counties, where net-fishing has gradually replaced deep-bait fishing, and in South Helgeland, where trawl-line fishing has, by degrees, increased while net-fishing has fallen off.

TABLE XV.—*Percentage of fishermen.*

	Variation between the modes of fishing from 1860 to 1880.					
	Netters.		Trawl-line fishermen.		Deep-bait fishermen.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
Combined Loffoden fishermen	66	34	55	21	14	8
South Trondhjem District	53	12	6	0	80	47
North Trondhjem District	58	20	7	0	74	38
South Helgeland Bailiwick	79	38	43	4	24	13
North Helgeland Bailiwick	90	69	19	3	15	3
Salten	65	33	63	25	12	3
Loffoden and Vesteraalen	49	9	90	49	4	0.5
Senjen and Tromsö	65	33	60	29	14	4

Table XVI shows the increase or diminution since last year (marked with the sign—) in the number using the different methods. With the exception of a slight increase in the Trondhjem counties, the number of net-fishermen has everywhere decreased; the number of line and deep-bait fishermen (hand-liners), on the contrary, has increased.

TABLE XVI.—*Number of men.*

District.	Increase or decrease in methods since last year.		
	Net.	Trawl-line.	Deep bait.
South Trondhjem County	48	— 6	99
North Trondhjem County	48	10	215
South Helgeland Bailiwick	—118	190	238
North Helgeland Bailiwick	—305	37	68
Salten Bailiwick	—197	450	—28
Loffoden and Vesteraalen Bailiwick	—141	768	66
Senjen and Tromsö Bailiwick	—202	284	146
Total	—867	1,733	832

In the last column of Table X is stated the number of hired men employed in the different districts. Table XVII gives the number in the various counties and bailiwicks for the last three years. In South Trondhjem County, and in Loffoden and Vesteraalen Bailiwick, the number was increased by 700 and 9 per cent., respectively; in Senjen and Tromsö Bailiwick it was diminished by 14 per cent.; the remaining places were unchanged.

TABLE XVII.

District.	Hired men.		
	1878.	1879.	1880.
South Trondhjem County	5	18	145
North Trondhjem County	57	84	79
South Helgeland Bailiwick	897	1,027	1,072
North Helgeland Bailiwick	573	668	670
Salten Bailiwick	453	594	602
Loffoden and Vesteraalen Bailiwick	1,182	1,511	1,649
Senjen and Tromsö Bailiwick	140	229	196
Total	3,307	4,131	4,413

Table XVIII gives the number of hired men for the last three years in the districts which have more than 100. The increase has been greatest in Buksnæs and Vegö, whose population almost exclusively fishes from Balstad (Buksnæs). The increase from Tjötö is due to the fleet therefrom fishing at Henningsvær.

TABLE XVIII.

District.	Number of hired men.		
	1878.	1879.	1880.
Stadsbygden	2	17	105
Vegö	112	136	180
Alstahaug	234	143	130
Stamnæs		121	112
Herö	76	106	116
Tjötö	265	314	334
Vefsen	134	137	117
Hemnæs	154	145	182
Næsne	280	299	267
Gildeskaal	104	116	134
Skjærstad	63	108	142
Flakstad	272	437	430
Buksnæs	469	588	691
Vaagen	209	236	241
Hadsel	171	153	176
Total	2,545	3,056	3,357

Table XIX shows the number of fishermen engaged at the different stations up to March 16, and their division according to the various modes of fishing. In Brettesnæs there were very few. In Kabelvaag there were 360 men less than last year, probably from the want of accommodations beyond Branden.

In most other places the fleet was larger than last year, especially in Henningsvær, which had 511 men more; in Stamsund, which had 312 men more; in Svolvær, which had 237 men more.

All the stations had a full fleet; consequently, during the shiftings, they became crowded.

TABLE XIX.

From what district.	Net.				Trawl-line.			Deep bait.			Total number.			
								Boats.						
	Men.	Crews.	Boats.	Net boats furnished with lines.	Men.	Crews.	Boats.	Men.	With lines.	Without lines.	Fishermen.	Crews.	Boats.	Number of hired men.
Eastward of Henningsvær:														
Brettesnæs, Skroven, Östnæsfjorden, Svolvær, Kabelvaag, Storvaagen, Örsvaag, Örsnæs, and Hopen	5,863	943	975	12	4,179	1,024	1,150	2,333	216	596	12,375	2,779	2,937	1,017
Henningsvær	2,496	423	423	..	1,947	411	411	788	2	241	5,231	1,077	1,077	950
Öerne to Ure:														
Öerne, Stamsund, Stene, and Ure	3,555	575	630	34	1,258	271	302	355	3	122	5,168	971	1,057	844
Brandsholmene to Rufsfjord:														
Brandsholmene, Balstad, and Rufsjord	502	79	136	54	1,741	370	376	12	..	4	2,255	453	516	813
Sund to Loffoden Point:														
Sund, Reine, Moskenæs, Sörvaagen, Aa	1,032	189	240	152	1,167	282	315	4	..	2	2,203	473	557	791
Westward of Henningsvær	5,089	843	..	145	4,166	923	..	371	3	128	9,626	1,897	..	2,448
Total in Loffoden	13,448	2,209	2,404	252	10,292	2,358	2,554	3,492	221	965	27,232	5,753	6,144	4,414

In Table XX is stated the relation between the number of fishermen and the catch for the different groups of stations in the last five years.

TABLE XX.

Region.	Relation between the number of fishermen and the catch.									
	1876.		1877.		1878.		1879.		1880.	
	Fishermen.	Fish.	Fishermen.	Fish.	Fishermen.	Fish.	Fishermen.	Fish.	Fishermen.	Fish.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Raftsundet	4	3	5	3	..	..	..	..	..	..
Brettesnæs–Hopen	52.5	46	46	44	52	42	47.5	34	45.5	52
Henningsvær	18	15.5	18	18	18	22	18.5	21	19.2	16.6
Öerne–Üre	8	11	12	15	12	16.4	18	18	19	12.4
Brandsholmene–Nufsfjord	9.5	..	8	10	8	9.8	8	13	8.3	9
Næsland–Lofotodden	8	13.5	10	9	10	9.8	8	14	8	10
Eastward of Henningsvær	56.5	49	51	47	52	42	47.5	34	45.5	52
Westward of Henningsvær	25.5	35.5	30	34	30	36	34	45	35.3	31.4

Eighteen hundred and eighty was the only year for five years in which the catch eastward of Henningsvær was proportionately larger than the registered population. Previous to that there was a marked difference between East Loffoden and West Loffoden fishing. There has been no such decided distinction of late years.

In 1876 the principal fishing was from Skroven eastward, and from Sund westward; in 1877, from Stamsund eastward; in 1878, from

Vaagene to Ure; in 1879, from Henningsvær westward, and partly in Skroven; in 1880, from Hopen eastward, and to some extent westward also.

The reason that the catch in East Loffoden is proportionally so large is, that nearly 500 boats, which had been engaged at stations farther west, participated here during ten to twelve days. The shares have, on the contrary, averaged larger from Balstad westward. The proportion between the number of fishermen and the catch has for five years given the following average:

Region.	Fishermen.	Fish.
	Pr. cent.	*Pr. cent.*
Brettesnæs–Hopen	48.7	41.6
Henningsvær	18.3	18.6
Oerne–Ure	13.8	14.6
Brandsholmene–Nufsfjord	8.4	10.6
Næsland–Lofotodden	8.8	11.3
Raftsund	1.8	1.2

Thus it appears that fishing has been comparatively better the farther west we go. The considerable number of small boats which from fear of the sea lie in East Loffoden has naturally contributed to the relatively light catch here. Moving during the fishery (shifting berth) has also had its influence in this number, not sufficient, however, to destroy the proportion entirely, especially westward of Urebjerg, since the shifting to or from this station is inconsiderable. It is evident that the table gives a correct expression of the proportion, because wherever there is, during one year, any great disproportion between the number of fishermen and the catch, this shows itself in the size of the fleet present there the next year. The same holds good also with regard to the choice of implements. Statistics prove, on the contrary, that in both respects it is impracticable to base judicious plans for the coming year's fishing upon the results of the foregoing year.

In last year's report, page 55, I directed attention to the comparatively good catch westward of Urebjerg from and during the year 1871, and I stated, as a proof of the profitable industry here, that hired help, in spite of the larger expenses of fitting out, had shown a considerable increase. This year the force in the region from Brandsholmene to Balstad is increased by 207 men, of which 85 was an addition to the number of hired men, and in the Flakstad stations there is a gain of 222 and 18 men respectively. Although the catch has been proportionally smaller this year than in most preceding years, I think I am justified in drawing the attention of fishermen to the more uniform annual fishery in these stations than in most of those lying farther to the eastward.

Table XXI shows the distribution of the fishermen in the different stations by districts. Of the large force of 6,100 men from Senjen and Tromsö this year, 73 remained west of Urebjerg, 9 of these west of Sund.

The increased frequenting of these stations has been perceptibly noticed from Salten and especially from Folden and Gildeskaal. The fleet from Örlandet, Stadsbygden, Melö, and part of Alstadhoug continue, as usual, almost exclusively in Henningsvær; the fleet from Vegö, in Balstad; that from Belfjorden and Veieren, west of Sund; and the force from Tjötö and Gildeskaal, partly in Henningsvær, partly in Flakstad stations. Of the fishermen south of Brönö only 26 remained westward of Urebjerg.

TABLE XXI.—*Statement of the distribution of fishermen from the different districts at the various stations.*

District.	Brettesnæs.	Skroven.	Östnæsfjorden.	Svolvær.	Kabelvaag.	Storvaagen.	Örsvaag.	Örsnæs.	Hopen.	Henningsvær.	Skokkelvigoerno.	Stamsund.	Steine.	Ure.	Sandsund.	Balstad.	Nufsfjord.	Sund.	Reine.	Moskenæs.	Sörvaagen.	Aa.	Total.
Soggendal	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Hongesund	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	8
Sund	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Bergen	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5
Davigen	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5
Selö	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	8
Aalesund	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	8
Örskoug	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Molde	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Eid	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Gryten	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Christianssund	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	12
Throndhjem	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	29
Orkedalen	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Hitteren	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	33
Hevne	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Stadsbygden	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	403
Rissen	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10
Örlandet	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	389
Bjugn	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	203
Aafjord	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	203
Björnör	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	65
Lexvigen	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	52
Stördalen	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11
Værdalen	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Stenkjær	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Ytteröen	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	37
Inderöen	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	12
Spærboen	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6
Siöd	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Beitstaden	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	20
Namsos	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	19
Fosnæs	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	12
Fladanger	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	23
Nærø	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	226
Kolvereid	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	127
Lekö	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	321
Bindalen	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	302
Brönö	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	866
Velfjorden	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	111
Vegö	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	496
Alstahaug	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	433
Stamnæs	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	469
Herö	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	587
Tjötö	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	905
Vessen	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	471
Mo	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	201
Ranen	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4
Hemnæs	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	505
Næsne	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	926
Donnæs	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	67
Lurö	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	284
Rödö	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	224
Melö	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	251
Gildeskaal	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	591

TABLE XXI.—*Statement of the distribution of fishermen, &c.*—Continued.

District	Brettesnæs.	Skroven.	Östnæsfjorden.	Svolvær.	Kabelvaag.	Storvaagen.	Örsvaag.	Örsnæs.	Hopen.	Henningsvær.	Skokkelvigoerne.	Stamsund.	Steine.	Ure.	Sandsund.	Balstad.	Nusfjord.	Sund.	Reine.	Moskenæs.	Sörvaagen.	Aa.	Total.
Bejeren																							160
Saltdalen																							407
Bodö																							490
Bodö Landsogn																							2
Skjerstad																							765
Folden																							642
Kjerringö																							29
Stegen																							760
Hammerö																							611
Lödingen																							719
Tysfjorden																							274
Ofoten																							798
Hadsel																							1,080
Sortland																							922
Bö																							24
Dverberg																							22
Flakstad																							922
Buksnæs																							1,586
Borge																							203
Valberg																							25
Vaagen																							1,200
Gimsö																							10
Kvædfjord																							590
Ibestad																							1,585
Throndenæs																							1,081
Sand																							162
Tranö																							92
Dyrö																							152
Maalselven																							42
Lenvig																							634
Hilleso																							8
Berg																							46
Balsfjorden																							212
Malangen																							105
Tromsösundet																							190
Tromsö																							182
Lyngen																							487
Karlsö																							99
Skjervö																							48
Hammerfest Lake																							7
Tanen																							2
Vardö																							10
Total																							27,232

Table XXII gives the number of vessels present in the different inspection districts at the end of each week. Lodging vessels, vessels laid up, and passenger vessels are not included in this enumeration, but only merchantmen. After March 16, 27 vessels arrived, 7 of them at Hopen and 17 at Sörvaagen inspection district.

TABLE XXII.—*Number of merchant vessels present.*

Week ending—	Ostmesfjord.	Skroven	Svolvær.	Vaagsnæ.	Hopen.	Henningsvær.	Stamsund.	Ure.	Balstad.	Reine.	Sorvaagen.	Total.
January 24	.....	7	3	.....	3	17	1	.....	.....	.....	.....	31
January 31	.....	9	6	2	6	28	9	.....	.....	.....	.....	60
February 7	.....	8	10	9	14	32	19	1	2	2	.....	97
February 14	3	17	41	54	84	145	85	7	15	4	.....	455
February 21	.....	32	50	73	77	135	87	12	18	10	.....	484
February 28	1	21	51	80	73	138	97	16	24	36	.....	537
March 6	.....	10	21	60	58	132	126	26	40	25	25	543
March 13	22	13	70	61	69	122	115	23	40	52	.....	587
March 20	62	46	101	100	75	77	65	13	22	51	.....	612
March 27	.....	70	111	.....	90	68	44	7	27	50	.....	467
April 3	.....	32	65	70	75	90	56	11	29	60	.....	488
April 10	.....	22	18	30	37	50	32	7	25	82	.....	303

Table XXIII shows the number of merchant vessels present for each half month during the last five years. From this it will be seen that the majority of the vessels came out earlier this year than usual, and also that they left earlier than last year, since only half of them remained at the close of the first week in April.

TABLE XXIII.—*Number of merchant vessels present.*

Date.	1876.	1877.	1878.	1879.	1880.
Middle of January	.....	.....	.....	15	.....
Beginning of February	80	120	80	140	60
Middle of February	300	340	240	280	455
Beginning of March	370	450	530	560	537
Middle of March	460	550	630	600	590
End of March	360	530	610	600	500
End of first week in April	.....	500	530	480	300

Table XXIV contains a statement of the number of merchant vessels and passenger vessels (Bygdefarere) present in Loffoden March 16, also their home port, rig, draft, and complement of men. In the last column is given the number of lodging vessels and vessels laid up. Of these last, 33 were from Loffoden and Vesteraalen, of which number three or four have been previously included among the passenger vessels, and the rest among the merchantmen. The total number of vessels here March 16 was 676, with a combined tonnage of 350,000 tons and a force of 2,932 men, including the captains, this being the largest number of vessels known to have been assembled in Loffoden.

TABLE XXIV.—*Number of vessels present March* 16.

Town or bailiwick.	Steamers.	Schooners or galeas.	Sloops.	Yachts.	Square-rigged galeas or coasters.			Total of vessels.		Total tonnage.	Average of—		Lodging or storage vessels.
					Merchant.	Passenger.	Smacks.	Number.	Crew.		Crew per vessel.	Draft in tons.	
Farsund	....	1	....	....	.....	.....	....	1	6	850	6.0	850	....
Stavanger	....	5	....	4	.....	.....	....	9	50	7,200	5.5	800	....
Haugesund	....	2	....	6	.....	.....	1	9	48	6,290	5.3	699	....
Bergen	2	7	6	93	1	.....	1	110	580	66,010	5.3	600	....
Florö	....	....	....	3	.....	.....	1	4	18	1,730	4.5	433	....
Aalesund	....	3	2	18	2	.....	2	27	133	14,320	4.9	530	....
Molde	....	2	3	7	.....	.....	....	12	59	7,150	4.9	596	....
Kristianssund	....	6	2	43	5	.....	5	61	282	27,870	4.6	457	....
Trondhjem	....	3	1	21	52	.....	2	79	400	41,010	5.0	519	2
Levanger	....	....	....	....	1	.....	....	1	7	600	7.0	600	....
Stenkjær	....	....	....	....	6	.....	....	6	32	3,650	5.3	608	....
Namsos	....	....	....	2	4	.....	....	6	25	2,720	4.1	453	1
Bodö	....	2	....	7	2	.....	1	12	52	6,100	4.8	508	....
Tromsö	....	....	....	1	.....	.....	....	1	4	300	4.0	300	....
Total from towns	2	31	14	205	73	.....	13	338	1,696	185,800	5.0	550	3
Söndhordland	....	....	....	20	.....	.....	....	20	100	11,180	5.0	599	....
Hardanger	....	....	1	12	.....	.....	....	13	65	6,660	5.0	512	....
Romsdalen	....	....	1	....	.....	.....	....	1	7	900	7.0	900	....
Nordmöre	....	....	....	1	.....	.....	....	1	4	400	4.0	400	....
Fosen	....	....	1	18	6	.....	2	27	114	11,170	4.0	399	2
Inderöen	....	....	....	....	2	.....	....	2	12	1,350	6.0	675	....
Namdalen	....	3	1	4	8	.....	3	19	96	9,550	5.0	503	....
Helgeland	....	2	1	37	9	32*	9	90	311	45,980	3.5	511	4
Salten	....	4	3	50	7	8	5	77	328	34,340	4.3	446	....
Lofoten and Vesteraalen	....	....	....	5	5	2†	1	13	53	9,050	4.0	696	33
Senjen and Tromsö	....	5	2	15	4	.....	6	32	146	14,530	4.4	446	1
Total from country, excluding towns.	....	14	10	162	41	42	26	295	1,236	145,110	4.2	489	40
Grand total	2	45	24	367	114	42	39	633	2,932	330,910	4.6	521	43

* Three of which traded. † Both traded.

Table XXV states the number of merchant vessels fitted out since 1860 from the towns and country districts most interested in the Loffoden fishery. The number of coasting vessels at the close of 1876, according to official statistics, was as follows: from Bergen 59, from towns in Romsdal District 71, and from Trondhjem 27; but the majority of the merchant vessels fitted out in the towns belonged in country districts. The total number of coasters in Romsdal District was 169, of which 102, or 60 per cent., were in Loffoden this year; 67 per cent. of the coasters in Nordland District and 33 per cent. of those in the district of Tromsö were in Loffoden.

TABLE XXV.

NUMBER OF MERCHANT-VESSELS FITTED OUT IN—

Year.	Towns.							Bailiwicks.							
	Bergen.	Aalesund.	Molde.	Kristiansund.	Trondhjem.	Namsos.	Bodö.	Hardanger.	Romsdalen.	Gulandet and Rosen.	Stördalen and Verdalen, Inderöen.	Namdalen.	North and South Helgeland.	S. Hel.	Lofoten and Vesternalen.	Senjen and Tromsö.
1860	30	7	4	29	130	....	....	....	....	16	33	26	45	63	38	16
1861	22	4	3	24	117	....	....	....	....	17	12	21	48	68	31	11
1862	23	3	....	26	94	....	....	....	....	6	17	23	45	69	24	12
1863	28	5	2	31	92	....	....	....	....	13	7	25	44	68	35	13
1864	25	....	1	32	83	....	....	....	....	15	1	19	48	73	24	24
1865	27	....	....	29	86	....	....	....	....	12	4	25	....	81	33	23
1866	15	1	..	24	77	....	4	....	....	18	3	24	....	79	19	27
1867	16	5	....	22	66	....	15	....	....	15	....	16	40	80	32	44
1868	26	3	1	24	75	2	18	....	....	25	1	23	57	87	28	41
1869	21	9	..	28	76	3	8	....	....	13	5	9	33	78	25	37
1870	24	8	....	24	64	....	10	....	....	19	7	5	41	68	30	25
1871	33	6	....	37	95	....	12	1	..	15	9	16	63	76	26	35
1872	31	2	1	38	59	....	19	....	....	11	1	17	30	55	30	25
1873	30	5	....	29	61	....	13	..	....	15	2	22	43	63	29	36
1874	45	12	3	27	57	1	6	....	1	13	....	19	51	70	32	26
1875	73	10	....	36	84	4	6	2	2	21	3	16	52	58	29	24
1876	61	16	4	46	65	..	15	6	5	14	....	....	75	63	31	31
1877	91	41	8	60	69	....	....	13	4	17	2	25	....	66	29	27
1878	115	34	6	63	64	5	14	17	3	33	5	15	62	85	32	33
1879	109	38	6	50	55	6	15	19	2	33	10	25	63	68	38	35
1880	110	27	12	61	79	6	12	13	1	27	12	19	58	69	11	32

Table XXVI gives the proportion between the fleets from towns and country districts since 1860. While the great majority of the merchant vessels up to 1876 were fitted out in country districts, the reverse has been the case of late years.

TABLE XXVI.—*Number of vessels.*

Year.	Merchantmen.			Passenger vessels (*Bigdefarere*).
	From towns.	From country.	Total.	
1860	200	237	437	64
1861	170	208	378	66
1862	149	196	345	58
1863	158	205	363	48
1864	146	204	350	50
1865	148	226	374	49
1866	121	218	339	58
1867	126	227	353	34
1868	151	262	413	52
1869	145	200	345	32
1870	130	195	325	26
1871	186	241	427	36
1872	158	170	328	33
1873	141	211	352	38
1874	156	214	370	34
1875	215	207	422	31
1876	211	245	456	36
1877	292	265	557	40
1878	329	302	631	37
1879	311	304	615	45
1880	338	*253	591	42

* Lofloden not included.

Table XXVII*a* shows the distribution of vessels at the different stations on the 16th of March.

TABLE XXVII *a*.—*Number of vessels present March* 16.

Fishing-station.	Steamers.	Schooners or galeas.	Sloops.	Yachts.	Merchant yachts	Passenger yachts.	Smacks.	Lodging vessels or vessels laid up.	Number.
Östnæsfjorden	1	1	1	32	3	....	1	.....	39
Svolvær	1	2	1	42	24	2	.....	4	76
Skroven	.....	5	3	6	3	.....	2	2	21
Kabelvaag	.....	4	.....	18	3	.....	.....	.....	25
Storvaagen	.....	4	.....	26	8	4	5	2	49
Ørsvaag	.....	1	1	12	3	4	1	1	23
Ørsnæes	.....	.....	1	6	3	.....	1	1	12
Hopen	.....	3	2	24	5	.....	1	1	36
Henningsvær	.....	10	4	78	20	14	6	15	147
Skokkelvigöerne	.....	.....	.....	1	.....	.....	.....	.....	1
Stamsund	.....	5	3	43	14	2	7	2	76
Stene	.....	4	2	9	8	1	4	2	30
Ure	.....	3	1	13	4	.....	1	.....	22
Balstad	.....	1	1	26	5	7*	3	4	47
Nufsfjord	.....	1	2	9	4	1	1	.....	18
Lund	.....	.....	.....	8	3	.....	2	1	14
Reine	.....	1	2	8	3	3	2	1	20
Sörvaagen	.....	.....	.....	6	1	4	2	7	20
Total	2	45	24	367	114	42	39	43	676

* Five of these traded.

The table below (XXVII *b*) shows the number of lodging vessels, or vessels laid up, and also their tonnage.

TABLE XXVII *b*.—*Lodging vessels, or vessels laid up, March* 16.

Fishing-stations.	Steamers.	Sloops.	Yachts.	Passenger vessels.	Smacks.	Number.	Total tonnage.
Svolvær	.....	.....	.....	.....	4	4	.....
Skroven	.....	.....	1	....	1	2	650
Storvaagen	.....	.....	.....	2	.....	2	1,100
Ørsvaag	.....	.....	1	.....	.....	1	250
Ørsnæs	.....	.....	.....	1	.....	1	606
Hopen	.....	.....	.....	1	.....	1	450
Henningsvær	2	5	.....	6	2	15	8,030
Stamsund	.....	.....	.....	2	.....	2	1,600
Stene	.....	.....	.....	2	.....	2	1,000
Balstad	.....	.....	.....	4	.....	4	2,400
Lund	.....	.....	.....	1	.....	1	600
Reine	.....	.....	.....	.....	1	1	300
Sörvaagen	.....	2	.....	3	2	7	2,500
Total	2	7	2	22	10	43	19,486

Table XXVIII states the percentage of merchant vessels present in the groups of stations named below during the last five years.

TABLE XXVIII.—*Merchant vessels present March 16.*

Region.	1876.	1877.	1878.	1879.	1880.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Raftsundet	3	5			
Brettesnæs—Hopen	54	45	51	42	44
Henningsvær	16	18	22	29	28
Œrne—Ure	10	18	16	16	21
Brandsholmene—Nufsfjord	7	7	6	7	9
Næsland—Lofotodden	10	7	4	6	6
Eastward of Henningsvær	57	50	51	42	44
Westward of Henningsvær	27	32	26	29	36
Number present in Ostnæsfjord	12	9	1		30
Number present in Raftsundet	15	7			

Table XXIX shows the number of vessels that traded during the fishery. The places whose vessels have not traded are omitted from the table. These are: Farsund, Stavanger, Florö, and Nordmöre, with a total of 15 vessels. One column shows how many vessels have traded, and the individual vessels which have dealt in two or more of the articles mentioned in the table are reckoned under each of these. Deducting the three passenger vessels from Helgeland and two from Lofoten and Vesteraalen, which have engaged in trading, 119 vessels or 20 per cent. of the 591 merchant vessels carried with them trading goods. Including the 30 merchant vessels from Loffoden, which were laid up, and which are omitted this year, the proportion becomes 19 per cent. In 1878 the number was 114, or 15 per cent.; last year 148, or 24 per cent. Of the vessels from Trondhjem 48 per cent. traded, and of those from Helgeland 29 per cent.

TABLE XXIX.—*Number of trading vessels.*

Home port.	Total number of merchant vessels.	NUMBER WHICH TRADED.								
		General trading.	Trading goods.							
			Dry goods.	Groceries.	General retail goods.	Grain and flour.	Chandler's wares.	Salt.	Wooden ware.
Haugesund	9	1						1	
Söndhordland	20	2				2			
Hardanger	13	1				1			
Bergen	110	17				12		6	
Aalesund	27	5						5	
Molde	12	1				1			
Romsdalen	1	1				1			
Kristiansund	61	2					2		
Trondhjem	79	38	10	15	19	6	2		
Örlandet and Fosen	27	4		1				3	
Stenkjær	6	2			2	2			
Levanger	1	1	1			1			
Trondhjemsfjorden	2	1			1				
Namsos	6	2		1					1
Namdalen	19	2	1			1			1
Helgeland	58	20	7	6	6	3	2	1	2
Bodö	12	1		1					
Salten	69	8	3	4	1	1	1	1	
Loffoden and Vesteraalen	11	9	2	2	3	2	1	1	
Senjen and Tromsö	32	5	2	2	2			1	
Tromsö	1	1						1	
Total		124	26	32	36	33	8	20	4

Table XXX gives the number of "other" outside industries attracted to Loffoden by the fishing.

TABLE XXX.—*Other outside industries represented March 27.*

Trade.	Skroven.	Svolvær.	Vaagene.	Hopen.	Henningsvær.	Stamsund.	Stene.	Ure.	Balstad.	Sörvaagen.	Total.
Merchants	20	19	62	2	26	20	3	3	4	3	162
Watchmakers§	2	1	7	2	9	4	2	.....	4	6	37
Gold and silver smiths§	1	.....	5	.....	2	.....	.....	.....	1	.....	9
Other mechanics	5	2	19	2	8	14	1	1	3	9	64
Photographers	1	1	3	1	5	2	.....	.....	2	2	17
Laborers	18	10	10	.....	65‡	13	1	2	6	.....	125
Splitters	8	8	21	4	13	2	.....	2	.....	.....	58
Wholesale buyers	28	45	80	39	110	42	20	6	18	22	410
Eating-house keepers	1	5	20†	.....	1	5	.....	.....	.....	.....	32
Musicians	.....	.....	8	.....	.....	1	.....	.....	.....	.....	9
Panorama exhibitors	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Acrobats, &c	.....	.....	7	.....	7	1	.....	.....	.....	.....	15
Without regular work	2	4*	20	1	4	.....	.....	.....	.....	.....	31
Total	86	95	262	51	250	104	27	14	38	42	969

* Two of whom were women.
† Fifteen of whom were women.
‡ Chiefly Hovedtrædere, p. 79.
§ Most of whom traded also.

For comparison with preceding years is appended, in Table XXXI, the number of "other" outside trades for the last five years. The number of dealers, including watchmakers, most of whom sell watches, was diminished by 32. The number of wholesalers was increased by 55, and of mechanics by 22. The number of photographers increased from 6 in 1876 to 17.

TABLE XXXI.

Trade.	Other outside industries.				
	1876.	1877.	1878.	1879.	1880.
Merchants	113	147	169	202	162
Watchmakers	35	53	14	20	37
Gold and silver smiths			39	9	9
Other mechanics				42	64
Photographers	.....	.....	6	12	17
Laborers	22	34	66	108	115
Splitters	21	37	61	75	58
Wholesale buyers	29	105	*317	365	410
Eating-house keepers	5	8	28	42	32
Musicians	.....	12	10	18	9
Exhibitors of panoramas, &c	.....	.....	.....	6	15
Without regular work	.....	.....	18	31	31
Total	225	396	728	939	959

*Herein are included those who belong in Loffoden.

Table XXXII shows the kinds of wares used in trade. As will be seen, only one man dealt in general retail goods, and 26 handled dry goods exclusively. The remainder, for the most part, sold chandler's wares and ready-made clothing, in connection, though to a small extent, with dry goods. All of the watchmakers and, so far as I know, about 15 of the dry-goods dealers had district licenses. Twelve such new licenses were issued this year—1 in Skroven, 8 in Vaagen, 1 in Hen-

ningsvær, and 2 in Balstad; 5 of these were granted to residents. The number of dealers this year was:

Residents	58
Inc mers	162
From vessels	124
Watchmakers	30
Goldsmiths	9
Total	383

or 1 for every 80 men who were present during the fishery.

TABLE XXXII.—*Number of incoming tradesmen.*

Kind of trade.	Skroven.	Svolvær.	Vaagene.	Hopen.	Henningsvær.	Stamsund.	Stene.	Ure.	Balstad.	Sörvaagen.	Total.
General retail goods	1										1
Chandler's wares			6		1				2		9
Dry goods		6	16			3			1		26
Ready-made clothing		7	22	1	2	4	3		1		40
Chandler's wares and clothing	10				4	2		3		3	22
Dry goods and clothing	8	5		1	14						28
Groceries and clothing			3			1					1
Ironware			3								3
Tinware			2		1	1					4
Watches and clocks			7		4	4					15
Books	1	1	6			4					12
Woodenware						1					1
Total	20	19	62	2	26	20	3	3	4	3	162

Table XXXIII states the number of persons who were entitled to sell spirituous liquors. The number is about the same as last year, that is, one for every 460 men present during the fishery.

TABLE XXXIII.

License.	Skroven.	Svolvær.	Vaagen.	Hopen.	Henningsvær.	Stamsund.	Ure.	Balstad.	Lund.	Sörvaagen.	Total.
Whisky:											
Wholesale and retail	2		1			1	1				5
Retail		1		1							2
Wholesale		1			1	1				2	5
Total	2	2	1	1	1	2	1			2	12
Wine:											
Wholesale and retail	2		4	1	2	5		1	1	5	21
Retail											
Wholesale		1	1			1		1			4
Total	2	1	5	1	2	6		2	1	5	25
Beer:											
Wholesale and retail	2	1	7	1	2	5		1	1	5	25
Retail			1			1					2
Wholesale		1				1		1			3
Total	2	2	8	1	2	7		2	1	5	30
Total number of dealers, 1880	6	5	14	3	5	15	1	4	2	12	67
Total number of dealers, 1879	6	3	14	3	8	10	3	2	4	12	65

Table XXXIV gives the number of days, Sundays and holidays included, from January 16 to April 14, wherein the weather, either wholly or in part, prevented the fishermen from setting or hauling their implements. Altogether, in East Loffoden during 43 per cent., and in West Loffoden during 48 per cent. of the fishing season the weather was such as to interfere with the business. This year, also, most of the unfavorable days occurred in periods, for instance, from January 20 to February 5, from March 4 to 14, and from March 30 to April 4.

TABLE XXXIV.

Month.	Detained by weather between January 16 and April 14.			
	East Loffoden.		West Loffoden.	
	Whole day.	Part of day.	Whole day.	Part of day.
January	8	2	10	
February	5	7	9	5
March	5	7	6	7
April	3	2	3	3
Total	21	18	28	15

Table XXXV gives the number of days of detention in port, because of bad weather, in the different inspection districts:

TABLE XXXV.—*Days of detention in port on account of weather from January 16 to April 14.*

Inspection district.	January.		February.		March.		April.		Total.	
	Wholly.	Partly.	Wholly.	Partly.	Wholly.	Partly.	Wholly.	Partly.	Wholly.	Partly.
Skroven	9	1	5	7	5	7	....	5	19	20
Svolvær	6	4	4	6	2	9	2	3	14	22
Vaagene	7	3	5	7	5	7	3	2	20	19
Hopen	9	1	5	7	6	6	3	2	23	16
Henningsvær	8	2	4	8	6	8	2	3	20	21
Stamsund	10	.....	6	7	7	7	2	3	25	17
Ure	10	.....	8	4	5	9	3	3	26	16
Balstad	10	.....	11	6	7	8	4	2	32	16
Lund	9	1	10	5	6	5	4	2	29	13
Sörvaagen	9	1	9	5	4	8	4	2	26	16

The report for 1878 and for 1879 contains a similar table, and I venture to repeat this year also what I have previously mentioned with reference to this subject, since certain persons still seek to maintain the opinion that the fishermen should be prohibited from going to sea unless the weather allows all of them to use their implements. The essential hindrances to the enforcing of such a general provision in practice are, first, that "sea-weather" may be differently construed by different persons, and, second, that fishermen not only from different stations but also from different inspection districts, where there may be permanent

differences in the stations, often have their implements placed in the same waters. It will frequently happen, therefore, that while one fisherman, who lives in a certain place, is legally entitled to haul his gear, another one who has his gear in the same waters may be forbidden to do so, because he lives at a different station. It is especially during the so-called partial sea-weather that so many different conditions, such as size of boat and crew, ability of the men, and their acquaintance with the water, distance of the gear from shore, situation of the place, currents, direction of the wind, condition of the fishery, &c., are to be considered in deciding to what extent the implements can be used, that the question can be settled only by the boatmen themselves.

Table XXXVI shows the average number of entire and partial storm-bound days since 1875. This year the weather has been nearly like the average of the last five years, and somewhat better than the average of the last four. On the other hand, the rough weather which occurred at the close of January and the beginning of February, during certain days, was unusually severe. The water, especially, was very high.

TABLE XXXVI.—*Average number of storm-bound days, partial and entire, from January 16 to April 14.*

Year.	January.	February.	March.	April.	Total.
1875	4.5	8	7.5	3	23
1876	5.5	11.5	8	9	34
1877	12	16.5	12.5	6.5	47.5
1878	8	15.5	13.5	3	40
1879	7	14.5	17	6.5	45
1880	10	13	12.5	5.5	41
Average number	7.8	13.2	11.8	5.6	38.4
Average per cent	49	46.5	38.1	40	43.1

Altogether 15 boats and one vessel were lost, in which six men perished while 71 were saved. The cause of the loss of the vessel at Henningsvær was dead calm combined with swell and current. The vessel was crushed, but the crew, consisting of five men, was saved. By other accidents three men were lost—one in Kabelvaag by a chance shot, one in Stamsund while trying in a state of intoxication to cross a foot-bridge, and one in Balstad through the sinking of his overloaded boat. Of those who perished by shipwreck at sea, five lived in Stamsund, and one in Moskenæs. The fishing season just closed has been the most fortunate since 1860 with regard to loss of human life at sea. The number of shipwrecks, on the other hand, was nearly as large as in 1876 and 1878, when 43 and 10 men were lost, respectively, and at the same time considerably larger than in 1875, when 17 men were lost. Table XXXVII states the time, place, cause, &c. (of loss), since 1875. This is based upon a form employed by pastor Eilert Sundt, in his time, and

according to which the explanations of shipwrecks occurring of late years are recorded. In these six years 95 persons were lost by shipwreck, 21 by other accidents, and 282 were rescued; so that 75 per cent. of the shipwrecked were saved.

TABLE XXXVII.

Year.	Total.	Month.					Place.												
		January.	February.	March.	April.	Undetermined.	Kaltsundet.	Brettesnes.	Ostnæsfjorden.	Svolvær.	Skroven.	Vaagsnes.	Hopen.	Hennigsvær.	Stamsund.	Ure.	Balstad.	Nusfjord.	Sund.	Kelne.	Sörvaagen.
1875	9	1	3	3	2	..	..	..	1	..	..	2	1	2	..	..	3	..	..	..	..
1876	16	2	7	3	4	..	..	..	1	3	..	..	2	2	2	1	..	1	2	1	1
1877	7	..	3	2	2	..	2	..	..	..	..	..	..	..	2	..	3	..	..	..	..
1878	14	2	4	8	..	..	..	..	..	..	1	5	5	1	..	..	..	..	1	..	1
1879	22	3	4	5	2	6	1	1	..	2	3	..	..	3	..	..	5	1	1	..	..
1880	15	..	4	10	1	..	..	..	1	1	4	..	2	3	..	..	..	..	..	..	1
Total	83	..	..	..	..	..	3	1	3	6	10	12	15	11	1	..	11	2	4	1	3

Year.	Occasion.			Accountability.			Number wrecked.		Lost by other causes.	Lost.	
	During the fishing.	On the voyage.	Other cases.	Unavoidable.	Avoidable.	Undetermined.	Saved.	Lost.		Total.	Proportion to 100,000.
1875	6	3	..	..	..	..	21	17	..	17	93
1876	13	3	..	2	..	..	40	43	4	47	221
1877	5	1	1	2	..	..	22	5	4	9	42
1878	12	2	..	6	8	..	58	10	3	13	57
1879	17	4	1	9	11	2	75	14	7	21	70
1880	11	4	..	1	6	8	66	6	3	9	29
Total	64	17	2	20	25	10	282	95	21	116	..

Table XXXVIII shows the mode in which the shipwreck took place, the cause so far as this has been ascertained, and the size of the boat. Of the 51 shipwrecks which have occurred in the last three years, 21, or 41 per cent., were caused by wind storms; 15 or 30 per cent., by heavy sea, and 9, or 18 per cent., by collision. Nearly the half (25) might have been avoided. Sixteen of these, or 64 per cent., were due to carelessness; 7, or 28 per cent., to rashness. Shipwreck occurred most frequently among line-boats, between four and five out of every 1,000 boats, which is a natural result of the business. Among net and deep-sea boats, there are two or three shipwrecks to every 1,000 boats.

TABLE XXXVIII.—*Loss of boats.*

Year.	Mode.								Cause assigned.							
	Total.	Filled or capsized by a sea.	Sailing in a gale.	Collision.	Run aground.	Sunk.	Overloading.	Other modes or unknown.	Total.	Carelessness.	Rashness.	Light ballast.	Bad equipment.	Drunkenness.	Ignorance.	Other causes.
1878	14	5	5	3	....	1	....	....	8	4	2	1	1	....	....	....
1879	22	7	7	3	1	1	2	1	11	8	3	....	....	....	....	....
1880	15	3	9	3	....	....	....	....	6	4	2	....	....	....	....	....
Total	51	15	21	9	1	2	2	1	25	16	7	1	1	....	....	....
Per cent*	....	30	41	18	2	4	4	2	50	64	28	4	4	....	....	....

Year.	Size of boat.								
	10-oared boats.	4-fenteruuming.	8-oared boats.	4-fjerdemanning.	Trenmanning.	Kjeks.	Yawls.	List boats.	Unknown.
1878	5	....	7	....	2	....	....	....	....
1879	4	....	11	5	1	....	1	....	....
1880	8	....	3	....	4	....	....	....	....
Total	17	....	21	5	7	....	1	....	....
Per cent*	†250	....	4	30	230	....	1	....	....

* Of 1,000 boats, 3.2. † Of 100,000 boats.

Table XXXIX shows the temperature of the air at Svolvær in degrees Celsius.

TABLE XXXIX.

Week ending—	Temperature of air.				Water temperature.		
	Average.		During the week.			Bottom.	
	Noon.	Lowest temperature.	Maximum.	Minimum.	Surface.	Five fathoms.	Ten fathoms.
January 24	—1.4	—4.4	2.8	—6.7	....	....	....
31	2.6	0.0	5.5	—3.9	3.2	3.5	....
February 7	1.5	—1.1	3.3	—4.4	....	3.6	....
14	1.4	—3.4	4.4	—6.7	2.4	....	....
21	—1.7	—4.6	1.7	—6.7	1.6	....	1.6
28	—0.6	—4.5	3.3	—8.9	1.2	....	2.1
March 6	—1.4	—6.5	3.3	—7.8	1.0	....	1.1
13	1.5	—3.0	4.4	—5.0	1.5	....	1.6
20	2.6	0.5	....	—3.9	2.0	....	2.2
27	3.6	—0.6	6.7	....	2.0	....	2.7
April 3	1.1	—5.6	....	—9.4	1.8	....	2.1
10	5.0	—0.6	8.3	—4.4	1.7	....	1.7
Average to April 14	1.3	—2.8	....	....	2.0	....	2.2

For comparison with the preceding years is here given the mean temperature at midday for each half month since 1877.

TABLE XL.

Time.	Air temperature at noon.			
	1877.	1878.	1879.	1880.
January 19 to 31	2.5	0.3	— 0.3	0.9
February 1 to 14	— 0.6	—0.9	— 5.0	1.4
February 15 to end	— 1.1	—0.2	0.4	—1.3
March 1 to 15	0.6	—0.3	0.9	0.1
March 16 to 31	0.9	2.2	2.5	3.3
April 1 to 14	2.1	4.8	3.8	2.7
Mean temperature	0.6	1.2	0.5	1.3
Mean low temperature	— 3.9	—3.0	— 4.0	—2.8
Maximum cold	—11.1	—9.4	—11.7	—8.9

Thus the mean temperature has been nearly the same as in 1878, whereas it has been one-half degree higher than in 1877, and nearly one degree higher than last year. The greatest cold, as in 1877, occurred in the latter half of February. While the severest cold in 1878 and 1879 was in the first half of this month, the temperature during the corresponding period this year was 2.0 degrees higher than in 1877; 2.3 degrees higher than in 1878; and 6.4 degrees higher than in 1879.

Comparing the air temperature with the fishing we find that the best catch was in the month of February: In 1877, during the third and fourth weeks* (the coldest); in 1878, during the second and fourth weeks (the coldest); in 1879, during the first and fourth weeks (the coldest and the warmest, especially the latter); in 1880, during the third and fourth weeks (the coldest).

Thus in these four years the best fishing in February has occurred in the last eight days of the month, which probably is simply a plain result of the time. The best fishing has occurred during the greatest cold. The air temperature, either at the time of the best fishing or during the days immediately preceding, appears, however, to have had no influence on the result of the fishery.

As a continuation of, and a necessary addition to, the observations of water temperature secured by the inspector during the winter of 1879, the telegraph inspector in Tromsö district, J. B. Lie, continued these at Lödingen, at depths of 30 and 100 fathoms, from May to December, both inclusive; 36 series of observations were taken at depths of 30, 36, and 100 fathoms. These are here given entire, since they are unique and of general interest. The inspector has kindly promised to have these observations continued this year at Lödingen and Sörvaagen.

*Not a calendar week, but a space of 7 days.

TABLE XLI.—*Observations made by direction of J. B. Lie, telegraph inspector in Tromsö District.*

	Date.	Air at 2 p. m.	Wind. Direction.	Wind. Force.	Weather.	Water temperature. 30 fathoms. Surface.	30 fathoms. 10 fathoms.	30 fathoms. 20 fathoms.	30 fathoms. 30 fathoms.	100 fathoms. Surface.	100 fathoms. 10 fathoms.	100 fathoms. 20 fathoms.	100 fathoms. 30 fathoms.	100 fathoms. 40 fathoms.	100 fathoms. 50 fathoms.	100 fathoms. 70 fathoms.	100 fathoms. 100 fathoms.	Remarks.
May	1	2.7	SW.	3	10	3.2	3.3	3.5	4.0	.....	.....	.....	.....	.....	.....	.....	.....	
	3	5.4	S.	1	1	.....	.....	.....	.....	3.3	3.0	3.5	4.8	5.3	6.0	6.4	6.5	Southerly current.
	5	1.2	SW.	3	10	3.2	3.2	3.4	3.6	.....	.....	.....	.....	.....	.....	.....	.....	Snow.
	7	−0.5	.....	.....	1	.....	.....	.....	.....	3.0	2.9	3.0	3.1	3.8	4.9	6.0	6.4	
	10	7.4	.....	.....	8	3.5	3.0	3.0	3.4	.....	.....	.....	.....	.....	.....	.....	.....	
	12	6.1	.....	.....	2	.....	.....	.....	.....	3.5	3.0	3.0	3.4	4.1	5.8	6.3	6.4	
	14	1.9	W.	1	10	3.3	3.0	3.0	3.4	.....	.....	.....	.....	.....	.....	.....	.....	Sleet.
Average	....	3.5	.....	....	....	3.3	3.17	3.22	3.6	3.27	2.97	3.17	3.77	4.40	5.57	6.23	6.43	
	16	4.7	NE.	2	1	.....	.....	.....	.....	3.7	3.6	3.1	3.1	4.0	5.5	6.2	6.4	
	19	6.5	ESE.	2	10	5.2	4.6	3.9	3.4	.....	.....	.....	.....	.....	.....	.....	.....	
	21	7.0	SW.	3	5	.....	.....	.....	.....	4.8	4.1	3.8	3.7	4.9	5.9	6.4	6.5	
	23	9.8	NE.	2	0	6.1	5.1	4.9	4.8	.....	.....	.....	.....	.....	.....	.....	.....	
	25	8.0	WSW.	3	8	.....	.....	.....	.....	5.1	4.8	4.0	4.5	5.7	6.0	6.3	6.4	
	27	8.1	.....	0	10	6.0	5.2	4.4	4.6	.....	.....	.....	.....	.....	.....	.....	.....	Northerly current.
	29	8.8	NE.	3	10	.....	.....	.....	.....	6.2	5.7	4.4	4.8	5.3	5.5	6.0	6.4	Storm on 31st
Average	....	7.6	.....	....	....	5.77	4.97	4.40	4.20	4.95	4.55	3.82	4.02	4.97	5.72	6.25	6.42	
June	3	11.1	NE.	2	0	6.9	6.0	4.7	5.6	.....	.....	.....	.....	.....	.....	.....	.....	
	5	14.6	NNE.	.....	.....	.....	.....	.....	.....	6.6	5.5	5.0	5.5	5.8	6.0	6.2	6.4	
	7	10.8	SN.	.....	.....	7.2	5.3	5.0	5.2	.....	.....	.....	.....	.....	.....	.....	.....	
	9	8.1	.....	.....	10	.....	.....	.....	.....	6.5	5.8	5.0	5.0	5.2	5.6	6.0	6.2	
	11	7.0	.....	3	.....	5.5	5.4	5.2	5.1	.....	.....	.....	.....	.....	.....	.....	.....	
	14	3.1	NW.	2	.....	.....	.....	.....	.....	6.0	6.0	5.3	5.0	5.0	5.3	5.8	6.2	Fog and rain.
	16	7.6	NE.	..	8	6.3	6.3	5.8	5.5	.....	.....	.....	.....	.....	.....	.....	.....	Snow squalls.
	18	7.3	.....	3	10	.....	.....	.....	.....	6.4	6.4	5.8	5.0	5.2	5.8	6.0	6.2	
	24	10.0	.....	.....	8	6.5	6.4	5.8	5.6	.....	.....	.....	.....	.....	.....	.....	.....	
	26	19.0	.....	0	7	.....	.....	.....	.....	9.0	7.2	6.0	5.4	5.6	6.0	6.4	6.5	
	30	13.5	SW.	2	3	8.2	6.7	5.9	5.7	.....	.....	.....	.....	.....	.....	.....	.....	
Average	....	10.2	.....	....	....	6.8	6.0	5.4	5.5	6.9	6.2	5.4	5.2	5.4	5.7	6.1	6.3	

TABLE XLII.

	Date.	Air.	Wind. Direction.	Wind. Force.	Weather.	Temperature of water. 30 fathoms. Surface.	30 fathoms. 10 fathoms.	30 fathoms. 20 fathoms.	30 fathoms. Bottom.	100 fathoms. Surface.	100 fathoms. 10 fathoms.	100 fathoms. 20 fathoms.	100 fathoms. 30 fathoms.	100 fathoms. 40 fathoms.	100 fathoms. 50 fathoms.	100 fathoms. 70 fathoms.	100 fathoms. Bottom.	Remarks.
July	2	21.6	.....	0	1	.....	.....	.....	.....	9.8	8.2	6.0	5.8	6.0	6.2	6.4	6.5	
	7	19.2	.....	0	0	13.0	10.5	7.0	6.0	.....	.....	.....	.....	.....	.....	.....	.....	
	9	14.6	NNE.	3	1	.....	.....	.....	.....	12.0	11.8	8.0	5.9	.....	.....	.....	.....	
	11	10.8	NW.	2	3	.....	.....	.....	.....	8.7	8.0	6.2	5.7	5.8	6.0	6.2	6.5	
	14	10.4	SSW.	2	6	8.5	7.9	5.8	7.6	.....	.....	.....	.....	.....	.....	.....	.....	
	16	12.2	NE.	2	10	.....	.....	.....	.....	9.8	9.2	7.3	5.9	5.7	.....	.....	6.6	
	18	17.6	NE.	2	1	10.0	9.2	6.4	6.0	.....	.....	.....	.....	.....	.....	.....	.....	
	22	21.0	.....	0	1	.....	.....	.....	.....	13.0	9.5	7.0	5.8	5.9	.....	6.3	.....	
	24	23.6	.....	0	10	11.9	9.1	5.9	6.0	.....	.....	.....	.....	.....	.....	.....	.....	
	26	15.8	S.	1	6	.....	.....	.....	.....	12.8	9.0	.....	5.7	.....	6.1	.....	6.5	
	28	23.1	.....	0	0	12.6	9.4	7.0	6.0	.....	.....	.....	.....	.....	.....	.....	.....	
	30	23.7	.....	0	0	.....	.....	.....	.....	14.0	10.5	.....	6.0	6.0	6.2	6.4	6.6	
Average	...	.....	.....	...	...	.....	.....	.....	.....	11.4	9.5	6.9	5.8	5.8	6.1	6.3	6.5	

TABLE XLII—Continued.

	Date.	Air.	Wind. Direction.	Wind. Force.	Weather.	Temperature of water. 30 fathoms. Surface.	30 fathoms. 10 fathoms.	30 fathoms. 20 fathoms.	30 fathoms. Bottom.	100 fathoms. Surface.	100 fathoms. 10 fathoms.	100 fathoms. 20 fathoms.	100 fathoms. 30 fathoms.	100 fathoms. 40 fathoms.	100 fathoms. 50 fathoms.	100 fathoms. 70 fathoms.	100 fathoms. Bottom.	Remarks.
August..	1	26.7	.....	0	4	14.5	10.0	6.9	6.5	....	....	....	....	....	....	....	....	
	11	19.7	NE.	2	2	....	....	....	....	14.5	12.5	8.0	6.0	6.0	6.0	6.2	6.5	
	13	18.4	.....	1	0	14.0	....	7.3	6.3	....	....	....	....	....	....	....	....	
	15	19.3	.....	0	1	....	....	....	....	14.8	9.5	7.7	6.1	....	....	6.3	....	
	17	23.7	.....	0	0	13.2	10.5	7.8	6.2	....	....	....	....	....	....	....	....	
	19	16.8	NE.	2	2	....	....	....	....	13.5	10.0	7.2	6.3	....	6.1	6.2	....	
	23	14.4	WSW.	1	10	12.0	10.0	7.2	6.4	....	....	....	....	....	....	....	....	
	26	12.0	W.	3	7	....	....	....	....	9.3	9.2	8.5	....	....	6.0	..	6.4	
	28	14.0	NE.	1	2	10.8	10.2	9.5	7.1	....	....	....	....	....	....	....	....	
	30	12.0	NNE.	4	9	....	....	....	....	11.2	11.2	9.3	7.2	....	....	6.1	6.5	
Average.	....	....	.....	....	....	....	....	....	....	12.6	10.5	8.2	6.2	6.0	6.0	6.2	6.5	
Sept.....	1	12.0	NE.	2	2	11.3	11.0	9.2	10	....	....	....	....	....	....	....	....	
	4	8.4	NE.	2	10	....	....	....	....	10.5	10.2	10.0	7.6	6.2	6.0	6.2	6.4	Rain.
	6	10.2	WSW.	3–4	8	10.8	10.8	10.0	8.5	....	....	....	....	....	....	....	....	
	8	11.4	NE.	2	1	....	....	....	....	10.9	20.9	10.8	9.2	7.5	6.7	6.0	....	
	10	10.6	SW.	4	10	10.7	10.7	10.8	10.0	....	....	....	....	....	....	....	....	Rain.
	23	12.1	NNE.	1	1	....	....	....	....	10.4	10.4	10.5	10.6	10.8	10.2	8.9	6.2	
	25	10.2	SW.	4	10	10.3	10.3	10.4	10.5	....	....	....	....	....	....	....	....	
	30	11.2	.....	1–2	5	....	....	....	....	10.9	10.8	10.7	10.8	10.6	10.6	9.9	6.2	
Average.	....	....	.....	....	....	....	....	....	....	10.8	10.6	10.5	9.5	8.8	8.4	7.7	6.3	
October..	2	12.2	NE.	1	0	10.8	10.9	11.0	10.8	....	....	....	....	....	....	....	....	
	4	13.4	SE.	1	5	....	..	....	....	10.0	10.0	10.6	10.7	10.6	10.6	9.2	6.2	
	6	8.8	S.	1	10	9.7	10.0	10.0	10.6	....	....	....	....	....	....	....	....	
	23	1.0	E.	1	8	....	....	....	....	8.6	8.9	9.0	9.0	9.7	9.8	6.9	6.3	
	25	0.6	NE.	1	0	8.7	8.8	9.0	8.9	....	....	....	....	....	....	....	....	
	29	4.0	S.	5	10	8.0	8.5	8.6	8.5	....	....	....	....	....	....	....	....	Rain.
Average.	....	....	.....	....	....	....	....	....	....	9.3	9.4	9.8	9.8	10.1	10.2	8.0	6.2	
Nov	3	–1.4	N.	1	2	8.0	8.0	8.2	8.0	....	....	....	....	....	....	....	....	
	6	1.0	.....	2	10	....	....	....	....	8.0	8.0	8.2	8.2	8.2	8.4	7.0	6.3	
	8	–0.9	NNE.	1	6	8.0	7.8	8.0	7.8	....	....	....	....	....	....	....	....	
	10	–0.2	.....	3	5	....	....	....	....	7.3	7.5	7.7	7.8	8.0	7.0	7.0	6.4	
	12	4.0	NW.	2	8	6.8	7.0	7.4	7.3	....	....	....	....	....	....	....	....	
	26	2.9	W.	2	10	....	....	....	....	5.5	6.7	6.8	7.0	7.1	7.2	7.3	6.5	
	28	4.0	ESE.	1	7	5.4	5.8	6.0	6.3	....	....	....	....	....	....	....	....	
Average.	....	....	.....	....	....	....	....	....	....	3.9	7.1	7.6	7.7	7.8	7.5	7.1	6.4	
Dec.....	3	–5.1	ESE.	1	7	....	....	....	....	6.0	6.0	6.2	6.3	7.0	7.0	6.6	6.3	
	10	–3.4	....	0	8	5.0	5.2	5.2	5.4	....	....	....	....	....	....	....	....	
	18	–3.4	NW.	1	1	....	....	....	....	4.0	4.8	5.1	5.5	5.7	5.8	6.5	6.3	
January .	5	–0.1	SW.	2	9	....	....	....	....	3.8	3.8	4.0	4.4	4.9	5.3	6.4	6.4	

NOTE.—The observations at 30 fathoms were made a cable's length from Lödingen light, those at 100 fathoms in the middle of the fjord. All the observations were taken in the afternoon.

Table XLIII shows the mean temperature of the water for each half month, also the mean temperature of the air at 2 o'clock p. m., which last was kindly communicated by Dean B. Kokk from daily observations made by him in Lödingen. All the temperatures are given in degrees of Celsius. From the observations it will be seen: First, that the summer heat has had little influence on the water temperature at depths greater than 40 fathoms and none at all at depths of more than 50 fathoms, at which depth the water has been uniformly 6 degrees if we except the slight deviations occasionally produced by the sinking of the surface water cooled during winter, bearing in mind, also, that three

months, from the close of April to the end of July, elapse before the water recovers from the effects of the winter temperature. At the bottom, in 100 fathoms, the temperature has been constantly about 6.4. It is further evident from this table that the water has not begun to grow cool before October, and also that the cooling has not occurred gradually, but has been rather uniform throughout until the middle of December, also that a somewhat shorter time is required to effect the normal winter condition—the coldest water at the surface and a gradually increasing temperature towards the bottom—than is required in summer to produce the opposite condition—the warmest water at the surface and a decreasing temperature downward. After the middle of December the decrease of temperature has been slower. The water has been warmest from the middle of September to the beginning of October; the temperature during this time has been uniformly between 10 and 11 degrees from the surface down to a depth of 70 fathoms. The fact that the temperature of the stratum of water lying between 30 and 70 fathoms increased so considerably in the space of three weeks can only, so far as the uppermost portion is concerned, be ascribed to the direct influence of the warm water lying above it, if we admit that its greater saltness makes it a better conductor of heat; but may certainly be explained more readily by an afflux of warm water, probably from the shallow places in Ofotfjord.

TABLE XLIII.

	Mean temperature of air (2 p. m.).	MEAN TEMPERATURE OF WATER.											
		30 fathoms.				100 fathoms.							
		Surface.	10 fathoms.	20 fathoms.	Bottom.	Surface.	10 fathoms.	20 fathoms.	30 fathoms.	40 fathoms.	50 fathoms.	70 fathoms.	Bottom.
May:													
First half	2.7	3.3	3.2	3.2	3.6	3.3	3.0	3.2	3.8	4.4	5.6	6.2	6.4
Second half	8.5	5.8	5.0	4.4	4.3	5.0	4.6	3.8	4.0	5.0	5.7	.....	.....
June:													
First half	9.3	6.5	5.6	5.0	5.2	6.4	5.8	5.1	5.2	5.3	5.6	6.0	6.3
Second half	11.5	7.0	6.5	5.8	5.6	7.7	6.8	5.9	.....	5.4	5.8	6.2	.....
July:													
First half	15.4	10.7	9.2	6.8	5.9	10.2	9.3	6.7	5.8	5.9	6.1	6.3	6.5
Second half	18.7	11.5	.....	6.4	6.0	12.4	9.5	7.1	.....	.....	.....	.....	6.6
August:													
First half	19.4	14.2	10.0	7.1	6.4	14.7	11.0	7.8	6.0	6.0	6.0	6.2	6.5
Second half	15.1	12.0	10.2	8.2	6.6	11.3	10.1	8.3	6.6	.....	6.0	6.1	6.5
September:													
First half	11.6	10.9	10.8	10.0	8.5	10.7	10.5	10.4	8.4	6.8	6.3	6.1	6.5
Second half	11.2	10.3	10.3	10.4	10.5	10.6	10.6	10.6	10.7	10.7	10.4	9.4	6.2
October:													
First half	6.8	10.2	10.4	10.5	10.7	10.0	10.0	10.6	10.7	10.6	10.6	9.2	6.2
Second half	1.6	8.3	8.6	8.8	8.7	8.6	8.9	9.0	9.0	9.7	9.8	6.9	6.3
November:													
First half	—1.5	7.6	7.6	7.9	7.7	7.6	7.7	7.8	8.0	8.1	7.7	7.0	6.3
Second half	0.6	5.4	5.8	6.0	6.3	5.5	6.7	6.8	7.0	7.1	7.2	7.3	6.5
December:													
First half	—2.4	5.0	5.2	5.2	5.4	6.0	6.0	6.2	6.3	7.0	7.0	6.6	6.3
Second half	1.6	.....	.....	.....	.....	4.0	4.8	5.1	5.5	5.7	5.8	6.5	6.3
January:													
First half	0.8	.....	.....	.....	.....	3.8	3.8	4.0	4.4	4.9	5.3	6.4	6.4

The temperature of the water has been taken daily at the surface and at depths of 5 and 10 fathoms. The results are set forth in Table XXXIX. The lowest temperature at the bottom and surface was 0.5 (in the beginning of March). The difference between the lowest weekly mean temperature at 10 fathoms last year and this year was only 0.2 at the surface and nothing at the bottom. The highest temperatures were 3.5 and 4.0 (beginning of February). Regular observations at greater depths, 30 and 80 fathoms, were not taken, for want of time. In all 38 series of observations were taken in 30 fathoms, and 40 at greater depths, against 63 and 58 last year. The same instruments were used in taking the observations as last year, namely, 2 Negretti and Zambra thermometers, which were kindly lent to the inspection party by the Meteorological Institute. The same instruments were used by Inspector Lie also. As the division into degrees is not very fine, an error in reading of $\frac{1}{4}$ degree is, of course, not rare. There appear, however, to be no more serious errors of observation. The observations were made first at the surface and gradually downwards towards the bottom.

TABLE XLIV.

Date.	Place.	Temperature of water at various depths from the surface to the bottom.											Condition of the fishery.
		Surface.	10 fathoms.	20 fathoms.	30 fathoms.	35 fathoms.	40 fathoms.	50 fathoms.	55 fathoms.	60 fathoms.	70 fathoms.	80 fathoms.	
Jan. 30	Svolvær	3.75	4.00		4.25			4.75		5.25	6.75	6.75	Irregular, mostly light.
Feb. 2		3.50	4.00		4.25			5.00		6.00	6.50	6.75	
6		2.75	4.00					4.50		5.00	6.00	6.00	
9		3.00	3.25		3.50			4.25		5.00	5.75	6.00	
16	Storvaagen	2.25	2.50		3.50		4.00	4.50		5.00			Few *trukket*, good fishing.
24		2.00	2.25		2.50	2.50	4.50	5.00	5.00	5.25			Irregular, mostly good.
25		1.75	2.25	3.50	4.50			5.00	5.00	6.25			Irregular, mostly light.
27	Stamsund	2.00	2.00	3.00	4.00	4.75							Uniformly good.
28		2.00	2.00	3.00	3.75	4.00							Fish abundant.
29		2.25	2.50	2.75	2.75	3.00							
Mar. 1		2.25	2.25	2.25	2.75	2.75							
3	(Strömmen)	1.50	1.75	1.75	2.00	2.00							
	Storvaagen	1.75	1.75	2.00	2.25	2.50							Exceedingly light.
10		1.25	2.25	4.00	5.00	5.50							Good fishing.
	Islændingen	3.00	3.75	4.75	4.75			5.00					Irregular, mostly light.
11		3.00	3.00	4.50	4.75			4.75	5.00	5.25			Exceedingly light.
	Sundsflaket	2.75	2.75	2.75	3.50			5.00					
12	Islændingen	2.50	2.50	3.00	3.25			4.50	5.00	5.50	6.25	6.25	Light.
15	Östnæsfjord	2.00	2.25	4.75	5.00			5.75		6.00	6.25		Good fishing.
18		2.00	2.00	2.50	3.25			4.00	5.00	6.00	6.00		
19		2.00	2.25		3.25			4.00	5.00		6.00		
	Stamsund	2.25	2.25	2.50	3.50			4.00					Light.
20	Östnæsfjord	2.00	2.25		3.25			3.75	5.25	5.50	6.00	6.00	Smaller, especially night-line.
21		2.50	2.25	3.25	4.50			5.50		6.00	6.25		Sunday.
22		2.50	2.50		3.25			4.50		6.00	6.00	6.25	Exceedingly light.
	Stamsund	2.25	2.25	2.50	3.00			4.50					Irregular, mostly good. Extremely light. In the rest of Lofloden no sea-going weather because of a SW. storm.
23		2.25	2.25		3.75			4.75	6.00		6.00	6.00	Almost no fishing.
24	Östnæsfjord	2.50	3.00	5.00	5.25			6.00		6.00	6.00	6.25	
25	Svolvær	2.50	3.00	5.00	5.25			6.00		6.00	6.00	6.25	Holiday.

TABLE XLV.

Date.	Place.	Temperature of water at various depths from the surface to the bottom.									Condition of the fishery.
		Surface.	10 fathoms.	20 fathoms.	30 fathoms.	35 fathoms.	40 fathoms.	50 fathoms.	60 fathoms.	70 fathoms.	80 fathoms.	
Mar. 26	Svolvær	2.50	2.50	4.00	5.00			6.00	6.00	6.00	6.25	Holiday.
27		2.25	2.50	2.75	4.50			5.50	6.00	6.00	6.00	Good net-fishing.
28		2.25	2.50		4.00			5.50	6.00	6.00	6.25	Holiday.
29		2.00	2.50		3.50			5.50	6.00	6.00	6.25	
30		2.00	2.25		3.00			5.00	6.00	6.00	6.00	Irregular; mostly light; few trukket.
31		2.00	2.25		3.00		4.50	6.00	6.00	6.00	6.00	Irregular; mostly light, though mostly good elsewhere.
	Stamsund	2.25	2.50	2.50	3.25		4.75					Irregular; mostly good.
Apr. 6		2.00	2.25	2.25	2.25		3.75					Irregular; mostly good; less, however, than March 31.
6		2.00	2.00	2.00	2.25		2.50	4.00	5.50			Net-fishing excellent; line light.
	Storvaagen	2.00		2.25	3.25	3.25						
12	Svolvær	2.00	3.00	4.25	5.00			5.75		6.00	6.25	
		2.28	2.54		3.69		4.27	5.20	5.70		6.21	

TABLE XLVI *a*.

Date.	Place.	Water temperature.				Condition of the fishery.
		Surface.	10 fathoms.	20 fathoms.	30 fathoms.	
		20 or 30 fathoms of water.				
Jan. 30	Svolvær	3.50	3.75		4.25	
Feb. 2						
6		2.75			4.00	
9		3.00	3.00		3.75	
16	Storvaagen	2.25	2.25	2.25		
21		1.25	1.75	2.00		
25		1.50	2.00	4.00		
27	Stamsund	2.00	2.00	2.75		Uniformly good.
28		2.00	2.00	2.50		Very good.
29		2.00	2.00	2.00		
Mar. 1		2.00	2.00	2.25		
3	(Strömmen)	1.25	1.25	1.75		
10	Iskændingen	3.00	4.00			
	Storvaagen	2.00	2.75		3.75	Very good.
11	Iskændingen	2.75	3.00	4.50	4.75	
13	Sundsflaget		4.00			
15	Östnæsfjorden	1.75	2.00	4.25	4.25	Very good.
18	Östnæsfjorden	2.00		2.25	3.00	
	Stene	2.25	2.50	2.75	3.75	
19	Stamsund				3.00	
	Östnæsfjorden	2.00	2.00			Very good.
20			2.25		3.25	
	Stamsund			2.25	2.50	
21	Östnæsfjorden	2.50	2.50	3.00	4.00	Sunday.
22		2.25	2.50		3.75	
	Stamsund	2.25	2.25	2.50	3.00	

TABLE XLVI *b*.

Date.	Place.	Water temperature. Surface.	10 fathoms.	20 fathoms.	Bottom.	Condition of fishery.
		Depth, 30 fathoms.				
Mar. 23	Östnæsfjorden	2.25	2.25	.....	3.50	
24	.....	2.50	3.00	.....	5.25	Very good.
26	Svolvær	2.25	2.50	3.75	4.50	Holiday.
27	.....	1.75	2.25	.....	3.75	Very good.
28	.....	2.25	2.50	2.75	4.00	Holiday.
29	.....	2.00	2.25	2.50	4.00	
30	.....	1.75	2.25	.....	2.50	
31	.....	1.75	2.25	.....	3.00	
	Stamsund	2.25	2.50	2.75	3.25	Irregular; mostly good.
Apr. 6	.....	1.75	1.75	1.75	.....	
	Storvaagen	2.00	1.75	2.50	.....	
12	Svolvær	1.75	3.00	.....	5.00	
		2.18	2.48	.....	.....	

As the observations at Lödingen in May, last year, agreed in the main with those taken at Loffoden in April, so also the observations at Lödingen on the 5th of January, this year, give the same result as in Svolvær on January 30; therefore the observation of the temperature of the water which has been conducted from January, 1879, to April, 1880, may be regarded as a continuous series.

The observations this year, as well as last, show that, as a rule, there is a rather sharp limit between a colder and a warmer stratum of water, while the mass of the layer increases and diminishes considerably in a comparatively short time. This fall of temperature appears not to have extended to as great depth as last year; the lowest temperature observed at 60 fathoms was 2.15, and, at 50 and 40 fathoms, 1.75, while this year the temperatures were 5.25, 4.00, and 2.50, respectively. In February and March a temperature as low as 2.25 has not been observed farther down than 20 fathoms from the surface in 80 fathoms of water, and it has been noticed only twice in the same depth of water 35 fathoms from the surface. It is possible, however, that observations taken between the 3d and the 10th of March would have given a different result; for the water appears to have been coldest this year at that time, although, because of the frequent and sometimes considerable changes at different depths, it is difficult to arrive at a definite conclusion about the subject.

Concerning the influence of the temperature of the water upon the fishery, allow me to state the arguments for and against this assumption.

The following statements favor the assumption:

1. This year the fish were always found either near the surface or in comparatively shallow water, and since the temperature at these depths was both rather uniform and rather high, at all events, in comparison

with last year, it is not improbable that the fish have been influenced thereby in their choice of locality.

2. Since fishing begun at Islændingen, the lower part of Sundströmmen, the temperature at 20 and 30 fathoms was $4\frac{3}{4}$ degrees. The floating implements placed 25 fathoms from the surface, and the bottom implements set in 25 fathoms, took plenty of fish, while nets placed on the bottom in 60 to 80 fathoms, where the temperature was six degrees, caught almost nothing. The same thing occurred in Östnæsfjorden and Svolvær during the fishing there. Many of the net-fishermen floated only a portion of their nets, and allowed the rest to remain on the bottom, and the catch was generally good in the floated portion, and exceedingly light in the bottom nets.

3. The excellent fishery at Stamsund and stations farther west at the close of February was associated with a rise in the water temperature, which, from 2.50 at a depth of 35 fathoms on the 21st, increased on the 25th to 4.50 in 30 fathoms, and 3.50 in 20 fathoms. The same was true of the good fishing which begun in Östlofoten March 10. The fishing mentioned in Buksnæsfjorden under "Fishing at the different stations," and also the advent of cod which was noticed, March 17, between Stamsund and Skokkelvigöerne, occurred at a time when the warm stratum of water had descended to 20 fathoms from the surface.

The conclusion which I reach from these observations is, that the temperature which appears best adapted to cod is between $3\frac{1}{2}$ and $4\frac{1}{2}$ degrees.

The circumstances which disprove the influence of the temperature of the water are the following:

1. Since there were some fish in the seines, though in smaller and comparatively unimportant numbers, it follows that a temperature of 5 to 6 degrees is, at all events, not a barrier to the presence of cod.

2. Although the good fishing westward of Stamsund begun with a temperature of 4 degrees in 30 fathoms, it remained good, and in the early part of March it was even unusually good here as well as at Gemsöströmmen, though the temperature gradually decreased to $1\frac{3}{4}$ degrees in 20 fathoms and 2 degrees in 35 fathoms—which again seems to indicate that comparatively cold water is not prejudicial to the thriving of cod.

3. The fishing, which was excellent at Sund March 10, was poor on the 11th, though the temperature conditions were the same on both days; so this appears to be no assurance of a permanently good fishery.

It is shown by the combined observations also that some good fishing has taken place in depths where the water temperature varied from 2 to 5 degrees. Since this is the greatest variation which has been observed during the winter on the banks, and since the taking capacity of a net is only 3 to 4 fathoms perpendicularly, I conclude that the temperature of the water does not play the role in the fishing that one would suppose, at first consideration, should be ascribed to it. Examinations of the temperature of the cod itself at different depths would have been interesting, but I had no thermometer which was suitable therefor.

The observations this year have indeed been few, although they were begun the same day or the day after the fishing commenced. Although the frequent and sometimes considerable and irregular falling and rising of the warm water scarcely allow any hope of a practical result, and in spite of the little encouraging conclusions whereto the year's observations have led, it is my intention to continue these observations as far as time allows.

Table XLVII shows how many livers made a barrel at different times during the fishery. The numbers above the line indicate those taken in nets, below the line those caught by lines. Compared with the four preceding years the fish this year have been distinctly fatter, and, especially, they have retained their fatness longer than usual. The increased proportion of liver in the districts of Stamsund and Sörvaagen at the close of February was associated with the excellent fishing there, and seems to indicate a new arrival (of fish). The stated proportion of liver at the end of the first week of March to the quantity of fish has not been so great in any of the four preceding years at the same time; and one may possibly, from this longer-retained proportion of liver, draw the conclusion that the East Loffoden fishery in March is due to the incoming of new fish and not to an afflux from West Loffoden. The observations are, however, highly uncertain, and cannot be otherwise; so it is difficult to base any decision upon them. On the average 385 cod are estimated to have yielded one barrel of livers, or 78 pots (0.65 barrel) of oil. According to the inspection tables, the proportion between fish and liver has been as follows:

	Cod.		Cod.
1869	450	1875	440
1870	350	1876	415
1871	400	1877	425
1872	350	1878	420
1873	390	1879	420
1874	400	1880	385

An average of 400 to the barrel of liver and 600 to a barrel of oil.

TABLE XLVII.—*Number of livers in a barrel.*

Week ending—	Östmesfjorden.	Svolvær.	Skroven.	Vaagsø.	Hopen.	Henningsvær.	Stamsund.	Ure.	Bulstad.	Sörvaagen.
January 24						0			0	
						300			300	
January 31		0			280	250				
		300			300	300				
February 7			280	280			300	350		200
			300	300			350	400		250
February 14	300	300		300			350	300		300
	340	350		350			400	350		350
February 21		300			300		280		0	350
		400			400		350		350	400

TABLE XLVII.—*Number of livers in a barrel*—Continued.

Week ending—	Östnesfjorden.	Svolvær.	Skroven.	Vaagene.	Hopen.	Hennningsvær.	Stamsund.	Ure.	Balstad.	Sörvaagen.
February 28	350	350	300			300			350	300
	450	450	350			350			400	400
March 6				320	350					300
				370	450					350
March 13			350	350		350	350	400	400	400
			400	450		400	400		450	500
March 20	400	400	400	400	400	400	300			500
	450	500	500	550	500	500	350			600
March 27				400		480	350	450	450	
				500		550	450	500	500	
April 3				420	450		400		500	
				550	600		480		550	
April 10				480		480			550	
				0		600			600	

Table XLVIII states the prices of net and line fish at different times during the fishing. The average price is assumed to have been about 15 öre for net fish, about 13 for line fish, 12 for deep-water fish, and in general, 13.70. Since 1860 there has only once been a lower price; this was in 1868, when the average was 13.33.

TABLE XLVIII.—*Prices of fish* (*in öre*).

Week ending—	Östnesfjorden.	Svolvær.	Skroven.	Vaagene.	Hopen.	Hennningsvær.	Stamsund.	Ure.	Balstad.	Sörvaagen.
January 17						12			0	
									12	
January 24				14						
January 31		14			12		0			
							10			
February 7		16	12	15		14	0	12		
		14	11	14		13	13.5			
February 14	14		16	16	18	17	16	14		14
			12	14	16	14	15	13		12
February 21		17	17	17	19		17.5	16.5		
		15	16	15	17		16	15.5		
February 28			18	17		18	18	18	15	16
			16	16		16	16	16	14	12
March 6		18			18		15	14		
		16			16		13	13		
March 13	10	15	17	14–16	17		14	18	14	15.5
	9	13	16	10–12	15		13	15	12	12
March 20	14	13	12	12–13	15	16	16		14	14
	10	10	10	10–11	13	14	14		13	12
March 27		16	14	12–14	13	15	14.5	14		15
		12	13	10–11	11	14	13	12		12
April 3			12	13–15			16		14	13.5
			11	10–11			15		13.14	12
April 10			14	0	14	12	16	17		17
			13	10–11	12	10	14	15		12

Table XLIX gives the prices of the other fish products and of bait. The prices of roe have been somewhat higher, of liver a little lower than in the last few years. According to these prices the value of one fish round has been 20.8 öre. Bait has commanded an unusually high price.

TABLE XLIX.—*Prices (in öre).*

Inspection district.	Liver.		Roe.	Heads.	Bait.			
					Herring.		Cuttle-fish.	Mussels.
	Fresh.	Old.			Fresh.	Salted.		
	Barrel.*			Millions.	Barrel.			
Skroven	20		16			20		
	14		20					
Svolvær	15			0.50		12	14	16
	12			0.70		20	20	
Vaagene	18	12	16	0.40		16	20	18
	12	10	21	0.50			28	24
Hopen	18	16	15	0.50		16	16	10
	12	12	22	0.70		20	20	20
Henningsvær	17	14	20	0.40		16		
	15	13	22	0.60		20	20	
Stamsund	20	14	18			14	18	
	17	12	22					
			18	0.60		16		
Ure			23	0.80		20		
Balstad	15		21	0.40		13	19	
				0.60		18		
Sörvaagen	16		18	0.50	20	14	18	
	12		22	0.60		20	16	

* This probably means so many öre per fish by the barrel and so many per head by the million.—TR.

Table L gives the Loffoden prices and the export values since 1873. Up to and for 1877 the export values are taken from the official statistics; for 1878 and 1879 they are quoted from the generous communication of the supervisor of the merchants' clerks in Bergen. According to this statement the export prices have been—

Export prices.	1878.	1879.
Split cod, per vog*	$1 66	$1 27
Round fish, do	1 54	1 27
Coarse-cut:		
Ling, do	1 88	1 54
Cod, do	1 74	1 47
Brosmius, do	67	64
Titling:		
Cod, do	1 81	1 61
Haddock and Brosmius, do	80	54
Large coal-fish, do	94	87
Medium coal-fish, do	86	59
Small coal-fish, do	54	43
Medicinal oil, per barrel	13 53	11 79
Refined oil, do	13 13	11 26
Clear brown oil, do	12 86	10 99
Brown oil, do	10 99	9 92
Roe:		
First quality, do	8 04	7 77
Second quality, do	5 36	5 00

* Thirty-six Danish pounds.

Of the total export of roe 15 per cent. is assumed to be of the second quality. The cost of split cod may be estimated at 8.8 crowns ($2.36) per 1,000.

TABLE L.—*Prices.*

Year.	Fish.			Roe.		Liver.		
	Average Lofoden price.	Export price.		Lofoden price.	Export price.	Lofoden price.		Export price.
		Split cod.	Dried cod.			For medicinal oil.	For other oils.	
	Per hundred.			Per barrel.				
1873	$6 21	$9 29	$5 91	$9 18	$13 18	$6 48–$7 56	$6 48	$9 61
1874	6 48	9 72	5 75	$11 88–12 42	15 23	7 56–8 64	$5 40–5 94	9 04
1875	5 94	8 75	.....	8 64–10 80	11 45	6 48–7 56	5 40	8 69
1876	5 40	11 34	6 45	8 64	11 96	7 29–8 77	4 32–5 40	9 64
1877	5 94	8 48	6 18	7 02–8 64	7 15	6 21–8 64	5 40	9 10
1878	5 40	9 29	*5 75	4 32–4 86	7 72	4 86–7 56	4 59–4 86	8 42
1879	4 68	7 13	*4 75	4 86–5 94	7 45	4 86–6 48	3 78–4 86	7 21

* Round fish only.

Table LI shows the yield of fish in the Lofloden fishery at the close of each week for the last five years. In this, as also in the following tables, certain items are wanting for 1878, since it has been hitherto impossible to obtain a statement of medical taxes for this year.

TABLE LI.—*Yield of Loffoden fishery.*

Month.	1875.		1876.		1877.		1878.		1879.	
	Date.	1,000 fish.	Date.	1,000 fish.	Date.	1,000 fish.	Date.	1,000 fish.	Date.	1,000 fish.
February	.....	.....	1	200	.....	.....	.....	.....	.....	.....
	.....	.....	5	600	3	130	2	360	1	1,000
	13	2,500	11	1,500	10	500	9	700	8	2,000
	20	3,750	19	2,500	17	1,500	16	2,500	15	2,750
	28	6,000	26	4,200	24	3,000	23	3,000	22	5,000
March	.....	.....	.....	.....	3	4,750	2	5,500	1	6,750
	7	9,000	5	7,500	10	8,250	9	8,500	8	7,500
	14	13,500	12	9,000	17	11,500	16	11,750	15	11,000
	21	16,500	19	11,750	24	17,000	23	17,750	22	16,000
	28	18,500	26	15,500	31	20,250	30	22,250	29	21,000
April	.....	.....	2	20,250	.....	.....	.....	.....	.....	.....
	4	21,000	9	21,250	7	24,250	6	23,500	5	24,750
	11	23,000	15	22,000	14	28,000	13	24,750	12	25,500
After deducting medical tax		23,000,000		23,000,000		28,000,000	.....	.....		25,250,000
Caught after April 14		180,000		500,000		1,500,000		250,000		60,000
Caught in January and February		6,000		6,000		4,000	.....	.....		6,750
Caught in March		13,400		14,600		16,250	.....	.....		15,250
Caught in April		3,600		2,400		7,750	.....	.....		3,250

Table LII shows the combined yield of the different fish products since 1873. The yield of fish in millions will be seen to correspond nearly with the number of thousand barrels of roe. This year the inspection estimates 34 per cent. more roe proportionally than for the preceding year. How far 1870 has been exceptional, or the estimate of the inspection has been erroneous, can, however, not be determined until the close of the year.

TABLE LII.

Year.	Yield of Loffoden fishery, including the fishing after April 14.							
	Total.	Embracing—		Heads.	Roe.	Oil.		Value in million crowns.
		Split cod.	Dried cod.			Medicinal.	Other oil.	
	Millions.				1,000 barrels.			
1872	18.2	10.7	7.5	4.7	19	0.7	33	5.1
1873	19.5	12.4	.....	4.8	18	0.5	.....	6.0
1874	16.0	10.9	5.1	5.5	15	0.4	27	5.1
1875	23.2	15.5	7.7	14.5	21	0.9	35	7.2
1876	23.5	18.0	5.5	13.5	24	1.4	35	6.5
1877	29.5	25.3	4.2	15.0	29	4.4	36	8.8
1878	.....	.....	3.7	18.0	.....	3.0	.....	.....
1879	25.3	21.6	3.7	21.0	26	2.7	36	6.0

Table LIII gives the yield of the rest of the fisheries in the districts of Nordland and Tromsö. The fact that the quantity of oil in 1879 was twice as great as in 1876, though the yield of fish from the summer and autumn fisheries was the same, is due, in part, to the circumstance that the home consumption of fish in 1879, because of the unsuccessful herring fishery, was considerably greater, which, as a matter of course, has had its influence on the quantity exported; and in part to the very small fishery at Finmark in 1876, which again affected the export of oil from Tromsö, some of whose fishermen bring home livers. This and the preceding table I have worked out from a critical examination of the different fishery reports, and I believe that even if there be found some errors of judgment, the statements may be regarded as tolerably correct in the main features and in relation to the amount of the different items.

TABLE LIII.

Year.	Yield of the fisheries in Nordland and Tromsö districts, excluding the Loffoden fishery.						
	Winter and spring fishery.					Summer and autumn fishery.	
	Total.	Divided into—		Roe.	Oil.	Oil.	Fish.
		Split cod.	Dried cod.				
	Millions.			1,000 barrels.			Millions.
1872	5.5	0.5	5.0	6.5	11.4	11.0	6.7
1873	4.5	.....	4.0	4.5	9.0	7.5	7.6
1874	2.3	0.3	2.0	2.5	4.5	9.5	10.2
1875	7.2	0.8	6.4	8.5	13.0	7.6	9.3
1876	8.0	1.4	6.6	10.0	14.0	6.7	9.2
1877	11.2	2.5	8.7	16.0	19.0	9.9	13.2
1878	4.4	0.4	4.0	5.4	7.6	.....	.....
1879	7.0	0.9	6.1	8.2	12.1	14.1	9.6
	6.2	0.9	5.3	7.7	11.3	9.5	9.4

Table LIV shows the inspector's statement of fish, roe, livers, and medicinal oil at the close of each week, also the number of fishing days. In the quantity of liver is not included that portion which is used in the manufacture of medicinal oil. Only a day on which there is fishing throughout the Loffoden Islands is considered an entire fishing day. The best yield in proportion to the number of fishing days and the size of the fleet was during the week from March 7 to March 13 (the most fish taken); the next best was in the week from March 14 to March 20. In January and February there were caught 6,000,000 (22.7 per cent.); in March, 18,500,000 (69.8 per cent.); and in April, 2,000,000 (7.5 per cent.). The number of fishing days from January 11 to April 14 made up 59 per cent. of the whole time.

TABLE LIV.—*Weekly statement of the yield.*

Week ending	1,000 fish.			1,000 barrels.			Fishing-days.	
	Total catch.	Salted.	Week's catch.	Liver.	Medicinal oil.	Roe.	Whole.	Part.
January 17	100	.....	.....	.....	.....	.....	5	.....
24	150	.....	50	.....	.....	.....	1	.....
31	170	.....	20	.....	.....	.....	.....	1
February 7	500	.....	330	1.6	.....	1.4	1	3
14	1,600	.....	1,100	5.0	0.2	3.7	3	2
21	3,000	.....	1,400	9.1	0.4	7.2	1	4
28	6,000	.....	3,000	18.0	1.0	14.0	4	1
March 6	9,250	6,000	3,250	25.0	1.5	20.5	2	3
13	13,250	9,750	4,000	36.0	2.0	26.5	.....	4
20	22,500	18,250	8,750	54.5	2.5	34.0	6	.....
27	23,500	19,750	1,500	57.0	3.0	34.5	1	2
April 3	24,500	20,750	1,000	59.0	.....	35.0	1	1
10	26,000	22,250	1,500	62.0	3.1	.....	4	3
14	26,500	22,750	500	63.0	.....	.....	2	1
				Oil, 41.0			31	25

Table LV shows the yield of fish, liver, medicinal oil, roe, and heads used for the manufacture of guano in the different inspection districts.

TABLE LV.—*Distribution of the catch by inspection districts.*

Inspection district.	1,000 fish.				1,000 barrels.			Million heads.
	Total.	Salted.		Dried fish.	Liver.	Medicinal oil.	Roe.	
		Ashore.	At sea.					
Skroven*	2,050	280	1,670	100	4.9	0.350	1.8	1.5
Svolvær	4,000	390	3,400	210	8.9	0.330	3.4	2.5
Vaagene	4,500	410	3,980	110	9.6	0.815	3.3	3.2
Hopen	3,250	520	2,660	70	6.8	....	3.8	2.2
Henningsvær	4,400	540	3,360	500	10.3	0.800	8.5	3.7
Stamsund	2,570	640	1,650	280	7.2	0.670	4.0	2.0
Ure	710	150	360	200	1.9	.....	1.4	0.2
Balstad	1,820	110	1,030	680	4.2	0.100	3.3	1.5
Sörvaagen†	3,200	290	1,310	1,600	9.2	.....	5.5	1.5
Total	26,500	3,330	19,420	3,750	63.0	3.065	35.0	18.3
*Amount for Ostnæsfjord	1,230	110	930	190	2.8	.....	1.2	.....
†Amount for Nufsfjord	580	60	330	190	1.8	.....	0.8	.....

Table LVI gives the catch of fish by the different methods.

TABLE LVI.—*Yield by the different methods.*

Inspection district.	1,000 fish.		
	Net.	Trawl-line.	Deep bait.
Skroven	1,320	570	160
Svolvær	1,000	2,400	600
Vaagene	3,500	470	350
Hopen	1,750	1,400	190
Henningsvær	2,330	1,900	170
Stamsund	1,950	500	120
Ure	200	450	50
Balstad	250	1,570	.....
Sörvaagen	1,000	2,190	10
Total	13,300	11,450	1,740

Table LVII shows the proportion between the different kinds of fishermen and the yield of the methods in the last five years. In the last three years the use of lines has given proportionally the best yield. A comparison of the last nine years shows that the use of lines has given the most certain yield, since there were only two years—1876 and 1877—wherein the catch was proportionally small in relation to the number of line-fishermen, while the use of nets has furnished a relatively small yield in six of the nine years.

TABLE LVII.

Year.	Proportionate yield of the various methods.					
	Net-fishing.		Trawl-line fishing.		Day-fishing.	
	Fishermen.	Fish.	Fishermen.	Fish.	Fishermen.	Fish.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
1876	43.0	52.0	45.0	43.5	12.0	4.5
1877	50.0	55.5	41.0	35.5	9.0	9.0
1878	58.0	57.0	32.0	38.0	10.0	5.0
1879	56.0	43.0	33.0	52.0	11.0	5.0
1880	49.0	50.0	38.0	43.0	13.0	7.0

Table LVIII shows the yield of the guano factories in the last five years. This year a factory was erected with English capital in Bretteснæs, while the Norwegian fish-guano company (Lerosen factory) was dissolved.

TABLE LVIII.

Year.	Yield of guano factories.					Heads consumed.
	Sanöen.	Lerosen.	Lyngvær.		Total.	
			Guano.	Fish meal.		
	Sacks of 200 pounds.		2-pound packages.		200-pound sacks.	Millions.
1875	11,650	8,000	4,000	.....	23,650	14.3
1876	10,000	9,960	3,100	1,900	23,060	14.0
1877	9,880	8,630	4,080	2,420	22,560	13.7
1878	13,500	6,150	2,210	1,200	21,869	13.2
1879	16,700	7,600	2,340	1,500	26,640	16.0
Average	12,350	8,070	3,140	.....	23,550	10 6

Of medicinal oil manufactories there are now two in Skroven, one in Svolvær, two in Kabelvaag, two in Henningsvær, and one in each of the stations Stamsund, Stene, and Balstad. Altogether they can utilize about 500 barrels of livers daily.

For consumption during the fishery are used 750,000 fish. For use at home fully 250,000 are sent. This million is not included in the foregoing statement.

According to the statement of the treasurer of the medical fund, the medical taxes for 1879 amounted, in the counties of Norland and Tromsö, to 95,129.33 crowns ($25,494.65), divided as follows:

	Crowns.	Dollars.
187,677 times 120 split cod, 22,521,240 fish	25,023.60	6,706 32
26,370 vogs of salted fish in vessel	293.00	78 52
718,013 vogs of dried cod,* 19,386,351 fish	23,933.77	6,414 25
271,706 barrels herring	18,113.73	4,854 48
597 barrels other salted fish	39.80	10 67
64,898 barrels oil	25,959.20	6,957 06
35,325 barrels roe	1,766.23	473 35
	95,129.33	25,494 65

For bait it is estimated that there were consumed 16,000 barrels of salted and 40 barrels of fresh herring, 8,000 barrels of cuttle-fish, and 1,300 barrels of mussels, the combined value of which was 400,000 crowns ($107,200).

The *aggregate gross yield* of the Lofföden fishery is worth a little over 5,500,000 crowns ($1,474,000).

Table LIX gives the average share which has generally fallen to the different methods of fishing, also the greatest share, as far as known to the inspection officers. The average share was 200 crowns ($53.60).

* Wherever dried cod are reduced from weight to number, 27 fish are calculated to a vog (36 Danish pounds).

The average was, in 1874, 270 crowns = $72.36; in 1875, 390 crowns = $104.52; in 1876, 305 crowns = $81.74; in 1877, 410 crowns = $109.88; in 1878, 300 crowns = $80.40; and in 1879, 240 crowns = $64.32.

Wages of hired men were from 100 to 120 crowns ($26.80 to $32.16) and expenses. In East Loffoden they were occasionally reduced to 80 crowns ($21.44).

TABLE LIX.

Inspection district.	Average share.			Highest share.		
	Net-fishermen.	Trawl-line fishermen.	Deep-bait fishermen.	Net-fishermen.	Trawl-line fishermen.	Deep-bait fishermen.
Skroven	$64 32	$48 24	$26 80	.....	.....	.....
Svolvær	53 60	42 88	37 52	$96 48	$85 76	.....
Vaagene	75 04	.....	32 16	160 80	53 60	$53 60
Hopen	64 32	48 24	34 84	134 00	107 20	.....
Henningsvær	53 60	42 88	32 16	107 20	85 76	.....
Stamsund	58 96	56 28	.....	115 24	69 68	.....
Ure	48 24	45 56	.....	75 04	80 40	.....
Balstad	69 68	69 68	.....	.....	.....	.....
Nufsfjord	80 40	72 36	.....	99 16	107 20	.....
Sund	75 04	75 04	.....	93 80	142 04	.....
Reine	80 40	.....	.....	91 12	107 20	.....
Sörvaagen	67 00	80 40	.....	88 44	125 96	.....
Moskenes	.....	75 04	.....	.....	112 56	.....
Aa	58 96	80 40	.....	61 64	125 96	.....

The loss of implements has been distinctly smaller than last year, especially so far as nets are concerned. In Skroven only one link was lost, and in Hopen ten to twelve, while, on the other hand, an individual in Kabelvaag has lost two settings. The loss of lines has been proportionally greater in Henningsvær and Balstad. The loss is everywhere attributed to a current, which set westward with unusual strength in the latter half of February. In the beginning of March it set eastward. From many places comes the complaint that the implements are too lightly weighted, both lines and nets, and a desire has been expressed that the law-making power should interfere. In order that the weights, which are at present insufficient, may be satisfactory they must be so heavy as to materially increase the labor of the ordinary daily business, so that it is doubtful how far they will secure any corresponding advantage. There was at one time an association in Stamsund whose members pledged themselves to use anchor-stones of a fixed weight; but, so far as I remember, it existed only one year, and I am not aware that the experiment was repeated.

Of floating implements floating lines were used exceptionally in East Loffoden and more commonly than before in West Loffoden. Floating nets were used only a little westward of Storvaagen, and then nets floated under water were always employed. Eastward nearly one-fourth of the men used surface-floating nets.

The Loffoden fishery this year has been next to the greatest known,

as the number of fish caught was at least 27,500,000, including what were used during the fishing and carried in for use at home. It exceeds the catch of the preceding year by one million, and is only a little over a million less than the catch of the rich year of 1877, when the yield to April 14, was 28,750,000. For individual fishermen, on the contrary, the yield was smaller than in any preceding year since 1869, if we except 1869. The average catch, excluding what was used during the fishing or at home, was 970 cod for each fisherman, or 100 fish fewer than the average from 1869 to 1879, both inclusive, while the average price, 20.8 öre for a round fish, is smaller than at any time during the period named. In order that the fishermen, at the prices of the year, should have a net profit of 100 crowns ($26.80), the catch should have been somewhat over six millions greater, or 33,600,000 in all.

Table LX shows how the gross expenses of the fishery, 5,500,000 crowns ($1,474,000), were divided among the different items of expense.

TABLE LX.

Items of expense.	Division of expenses.	
	Total.	Per cent.
License ($14.20 per fisherman)	$385, 920 00	26.0
Food	343, 040 00	23.0
Leather goods	58, 960 00	4.0
Wood and lodging	67, 000 00	4.5
Bed-clothing	13, 400 00	1.0
Expense of laying up	72, 360 00	5.0
Boat hire	91, 120 00	6.2
Interest and wear and tear	259, 960 00	17.6
Loss	80, 400 00	5.4
Bait	107, 200 00	7.3
	1, 479, 360 00	100

The costs are divided as follows: For implements, 2,010,000 crowns, or 36.5 per cent.; personal expenses of fishermen during the fishery, 2,070,000 crowns, or 37.5 per cent.; and only one-fourth part, 1,440,000 crowns, or 26 per cent., remains for the support of the family and other expenses at home, partly during and partly outside of the fishing season.

The course of the fishery was, in the main, as follows: As early as the beginning of January a considerable number of cod appeared to be present from Vaagen westward, particularly at Stamsund and westward from Sund. Fishing was carried on, however, by several resident fishermen. In the middle of January 900 boats had arrived; but bad weather almost totally prevented work for the rest of the month and during the early part of February. From the middle of February to the 9th of March was the height of the fishing season from Henningsvær westward, and the fishing was partly good from February 24 to March 4, while it was poor eastward, except at Hopen February 27 and 28 and March 1, when it also became to some extent good here, especially with

trawl-lines. On the 8th of March exceptionally good fishing began at all stations from Hopen eastward to and including Östmæsfjord; westward there was good fishing, also, everywhere until the 10th, when it became poor at stations from Balstad westward; at the remaining stations the good fishing continued until the 12th, after which date it was poor everywhere. In East Loffoden there was an especially good fishery from March 14 to the 20th, during which week 8,750,000 fish were taken, the largest week's catch known to have been made. The East Loffoden fishing closed, so far as Östmæsfjord is concerned, on the 20th, and at the remaining stations about a week later. At the close of March fishing began again to be sufficiently good, though irregular, from Henningsvær westward. It was, however, not permanent, except at the first-named station and in the region from Sund westward, where it was quite good even until the middle of April.

A peculiarity of this year's fishery was that the cod almost from the beginning remained near the shore; besides, they were found near the surface, and most of the fishing was done at depths of 30 to 40 fathoms, and sometimes less. Their presence in not inconsiderable numbers was proven, also, in many places inside the reef, where they ordinarily seldom appear, as at Islændingen, near Sund, and in various coves of Buksnæsfjord. On a voyage from Stamsund to Balberg Islands, on March 17, the inspection employés observed in many places, where the depth allowed the bottom to be seen, fish as large as cod, all of which were moving northward and towards the land.

Table LXI gives the percentage of fishing days on which there has been good fishing in the different inspection districts.

TABLE LXI *a*.

Per cent. of good fishing days from January 16 to April 12.

Inspection district.	Net fishermen.				Trawl-line fishermen.				Day fishermen.	
	January.	February.	March.	April.	January.	February.	March.	April.	February.	March.
Svolvær	.....	27	76	.....	14	30	70	.....	22	78
Skroven	25	0	83	.....	0	53	81	....	33	53
Vaagene	.....	47	78	.....	.....	.....	*50	.....	31	64
Hopen	0	33	94	14	50	80	85	.....	35	81
Henningsvær	.....	85	50	37	67	95	69	100	64	56
Stamsund	100	.....	.....	15	.....	59	53	.....	67	50
Ure	.....	90	62	.....	0	100	72	.....	.....	.....
Balstad	.....	.....	60	.....	67	69	74	30	.....	.....
Sund	.....	89	44	100	80	93	47	70	.....	.....
Sörvaagen	.....	80	.....	.....	.....	.....	64	70	.....	.....

*Not used from the middle of March. †Little used.

The course of the fishery this year appears at first view to indicate a movement of the schools of fish first from east to west, then from west to east, and finally again from east to west, since the fishing, which was

tolerably good everywhere in the first half of February, was so in the second half and until March 8, almost exclusively from Henningsvær westward; later, on the contrary, and until the close of the month, that is, from the 15th, almost entirely from Hopen eastward. The following facts, however, antagonize this opinion:

1. Fishing began at all the easterly stations on the same day.

2. It continued in West Loffoden with a good yield many days after it had begun in East Loffoden.

3. It closed in West Loffoden at the same time at the majority of the stations.

If there was a marked advance from west to east this should have been shown by an increased fishery from west to east, if only for a short time. Of course from March 4 to the 14th there was no common fishing day, and four whole days were spent ashore, the 6th, 7th, 9th, and 13th, so that it was difficult to follow the course of the fishery. An advance should, moreover, have secured an exceptionally good catch for the implements employed; but this was not so marked as to be conclusive. No relation between the fishing at the different stations, therefore, can be shown this year with certainty. In order to reach a conclusion, if possible, in the future, I shall continue the detailed records of the fishery which I begun in 1878. In the following table is given a synopsis of the course of the fishery during the last three years:

TABLE LXI *b*.

Time.	1878.	1879.	1880.
First half of February.	Eastward of Henningsvær, to and including Svolvær, Raftsundet.	Henningsvær to Balstad.	Westward of Sund. Ordinarily quite good line fishing everywhere.
Second half of February.	Eastward of Henningsvær, to and including Svolvær.	Henningsvær to Stamsund, and part of Skroven.	Westward of Henningsvær.
First half of March	Ure to Hopen.....	Good fishing everywhere.	To the 8th, westward of Henningsvær; from the 8th, eastward of Hopen, to and including Östnæsfjord.
Second half of March ..	Balstad to Vaagen	Westward of Henningsvær.	Eastward of Hopen, to and including Östnæsfjord.
April.....	Westward of Stamsund.	Westward of Balstad	Henningsvær, and westward of Sund.

Since the conditions in Raftsundet, Östnæsfjorden and Gimsöströmmen appear to be, in a measure, similar, I have examined the fishery in these places of late years, as far as there was any to investigate, when I have had the materials to work upon. From the following table it will be seen, meanwhile, that there is no regularity here, as one year there may be fishing in all of the three places, during another year in only one of them. As is well known, all experienced fishermen have fixed signs by which they believe they can foretell the course of the fishery. Though such rules of experience are generally based only on observations within an extremely limited circle, they may possibly have some value, wherefore I seek, as far as possible, to confirm their correctness or incorrectness.

TABLE LXI c.

Year.	Condition of the fishery.		
	Raftsundet.	Östnæsfjorden.	Gimsöströmmen.
1866	Quite good during the first half of March.	Excellent from the end of February to the end of March.	
1868	Almost nothing taken	Good fishing from the end of February to the end of March.	Excellent from the 11th to the 28th of March.
1875	Excellent fishing from the middle of February to past the middle of March.		Small fishery.
1876	Good, partly excellent, about the middle of March.	Small in February	Nothing taken.
1877	Good, partly excellent, from the 5th of March to the beginning of April.	Partly good line fishing during the last half of March.	Quite good in the middle of March, especially from Stamsund.
1878	Quite good about the middle of February.	Small line fishery in the middle of March.	Good, partly excellent, fishing some days in the early part and middle of March.
1879	Nothing caught	Almost nothing taken	Good, partly excellent, 6 days from the middle of March.
1880	do	Excellent fishing from the 8th to the 20th of March.	Good, partly excellent, at the close of February and the beginning of March.

Comparing the catch of each fisherman for some years past, we find the following averages:

	Cod to each man.
In 1869	820
In 1870	1,170
In 1871	1,000
In 1872	1,080
In 1873	1,130
In 1874	850
In 1875	1,260
In 1876	1,080
In 1877	1,310
In 1878	1,090
In 1879	980
In 1880	940

An average of 1,060 cod to each man.

The difference between the highest and lowest catch was 490 cod. From this number, however, we cannot draw any conclusion, as the place where the fishing was done, the number of fishing days, the time at which these days fell, and the time of the arrival of the fleet have considerable influence upon the catch, and the data are accurately determined for the last four years only. Of really excellent fishery years there appear to have been only two during this twelve years period, 1875 and 1877; and of poor years there were also two, 1869 and 1874.

The fishing at the different stations was as follows:

Brettesnæs.—Here there was no fishing.

Skroven.—Inner side (east side). In February there was, in part, a good catch here with nets as well as with lines. There appears, however, to have been no important fishery. West side. In January the

fishing was exceedingly small. In February and in the beginning of March it was irregular and light except with trawl-lines during the second and third weeks of February, when these implements brought good and occasionally even excellent results. From the 10th of March to the 22d, on the other hand, the fishing was exceptionally good for all of the implements. At the close of the month it declined, and in April it was poor. The principal fishing this year was at "Hölа."

Svolvær.—Trawl-lines were first used December 30, and were hauled on the day following with a catch of 13 cod. The next attempt was made January 10 by three boats, which took 2, 8, and 11 cod respectively. At the close of January the catch amounted to 100 for each boat employed. In February and March the trawl-line fishing was irregular and light as a rule until the 8th, from which time it was uniform and good, sometimes excellent, almost to the close of the month. In April it was light again.

Nets were first used February 9. They were set on the 11th, and caught from 100 to 400. On the 12th the catch of nets set at night was from 100 to 700. If we except the 19th, when nets set at night exceptionally took 800, the fishery was irregular and light until March 8th, from which time it was excellent until the close of the month.

Deep-bait and day-line fishing were poor during the whole time except from the 8th to the 31st of March, when the boats frequently got two or three loads daily.

Östnæsfjorden.—Here the fish were found in January as well as in February, and were caught at Langestrand, even in quite large numbers, in the second week of February, especially with day lines. At the close of February and in the beginning of March the fishing was extremely uncertain until the 8th, at which date it became excellent, and continued so until the 20th, when it suddenly ceased. Thus on the 19th the catch in nets amounted to 2,000, and on night lines, 600; on the 20th these implements caught 900 and 80 respectively. The 21st was Sunday. On the 22d the fishing was extremely uncertain; on the 23d the nets and day lines were not once attempted, and the catch on trawl-lines was from none to 15.

Although the fish disappeared suddenly from Östnæsfjord, they remained in the neighboring district of Svolvær eight days longer; since as late as the 27th as many as 1,200 were caught in nets set at night, and as many as 400 on trawl-lines. The 28th and 29th were holidays. On the 30th the fish here, also, suddenly disappeared; the catch in nets set at night was from 5 to 50. As usual, there were some herring in the fjord.

Vaagene.—The lines set at night, six in number, were hauled for the first time on the 9th of January, and took from 50 to 150 cod per boat. In the first half of February this fishery became, towards the close, irregular, but quite good. Later it was poor until March 8, from which date boats as a rule returned with full loads until the close of the month. In April again it was poor.

Nets were first used January 16 by four boats, which caught 100 cod. In February there was occasional good sea weather, as on the 7th, when the average catch was 300, and from the 14th to the 21st. During the remaining time the fishing was poor, except from March 8 to the 21st, when it became good—in part excellent. On the last-named day the nets took as high as 1,400; on the next sea-going day, April 5, 50–1,200, being an average of 300; on the 6th, on the contrary, from none to 150.

The deep-bait and day-line fishing in February were somewhat better than in the districts previously named. In the plentiful period, from March 8 to 31, there were, however, some days, for instance, the 20th, 27th, and 31st, on which the fishing with this apparatus was poor, though the other implements did well.

Hopen.—Trawl-lines were first used on the 7th of January with a catch of 100 cod. During the rest of the month the catch varied from 20 and 30 to 150. From the 6th of February to the end of March, the trawl-line fishing was uniformly good, often excellent, if we except certain days in the beginning of the last-named month. Thus on the first of March the average catch was 350 fish; from the second to the fourth, on the contrary, only from 70 to 100, whereupon the fishing became uniformly good again, sometimes excellent.

Four nets were first used January 22, and took from 8 to 150 fish. In January and the first half of February the fishing was irregular, mostly poor; during the rest of the month, on the other hand, though generally irregular, it was mostly good. From March 8 to 31 it was uniformly good, though not so excellent as in the more easterly stations.

Deep-bait and day-line fishing, with occasional short interruptions, were next best from the middle of February to the close of March.

The rare occurrence on January 30 is stated of a great school of large and small coal-fish (*Merlangus carbonarius*) inside of "Bikja."

Henningsvær.—Four lines were set for the first time January 8. They were hauled on the 10th, when the highest catch was 150. In February the fishing increased and continued uniformly good, especially at the close of the month, until the middle of March, whereupon it became irregular, mostly poor. In April it increased again, and remained quite good until the middle of the month, when it ceased.

Nets were hauled for the first time, January 22, with a catch of 40 cod; the second time, January 28, with a catch of 250 cod. As the line fishing increased in February, so also did the net fishing, but the latter was more uniform. The best fishing occurred at the end of February and in the beginning of March. From the middle of March to the close of the fishery it was, with some exceptions, rather irregular and mostly poor.

Day-line and deep bait fishing became good, sometimes very good, at the end of February and the beginning of March. The rest of the time they were poor, and ceased in some places entirely from the middle of March, when the majority of the boats shifted eastward.

Gimsöströmmen.—Fishing was good here from the middle of Feb-

ruary until near the middle of March, sometimes excellent during certain days at the beginning and end of the months named.

Stamsund.—Four lines set at night were hauled for the first time, January 10, near shore with a catch of 30 to 80 cod. During the four sea-going days which occurred in the week between the 11th and the 17th of January, the catch was uniformly good, up to 300 per boat. Between the end of January and the middle of February there were nearly two days of poor fishing; from the middle it remained good until towards the middle of March. Later it was irregular and poor.

Nets (set two or three nights) were first hauled January 17, and they took from 300 to 950 cod. If we except the close of the second week of February, this mode of fishing was good until the middle of March, whereupon it became poor, and so remained for the rest of the fishery.

Deep-bait fishing was good at the end of February and the beginning of March.

Ure.—Lines (set at night) were hauled first on the 8th of January with a yield of 40 to 50 cod, which catch on the following week increased to about 100 on two to three tubs of trawl. From the beginning of February to the middle of March fishing was uniformly good; later, with the exception of a couple of days at the close of the last-named month, on the contrary, it was poor.

One net set January 28 was first lifted February 4 and caught 12 cod. On the 5th two boats hauled one which was set at night, and they took 8 and 13, respectively. From February the fishing was nearly as in Stamsund, and likewise here during the last week of February and the early part of March it was excellent.

Day lines, which went into use in the beginning of March, did well until the middle of the month.

Balstad.—In the second week of February line fishing was variable and poor, but after that quite good until the middle of March. At the close of this month and in the beginning of April there was some good sea-going weather also.

Net fishing begun with March and then became quite good, and for a few days even very good, until the middle of the month.

In the middle of February cod were observed in Buksnæsfjord, as the native fishermen caught on night lines as well as day lines from 5 to 30 fish. There was no fleet up there, however, before the middle of March. Nets and lines set on the 16th in Gravdal Bay and Gjerstad Cove were hauled on the following day with a catch of 100 to 150. On the 18th the fishing was quite good, especially with nets, but extremely variable. On the 19th and 20th many fishermen gathered and succeeded well with nets—on the 20th exceedingly well even with day lines, while the night-line fishery was small. On the 22d the fishing was ended. Since small herring were seen at the same time in the fjord, the cod are supposed to have followed them. The cause of this fishery can hardly be ascribed exclusively to the herring, since these were present in large schools as well before the cod appeared in any

abundance as after the close of the fishing. The fishing took place in from 16 to 30 fathoms of water.

Sund.—Lines were first used January 6, and caught from 50 to 100 cod. Later the fishing was done farther in, and the catch here appeared to be somewhat more uniform. In February and until March 11 the fishing was evenly good; later it was poor, until the close of the month, when it again became good. In April it was variable, mainly good, until the 9th, when it began to be small.

Nets were first used by two boats January 28, with a catch of 200 cod. After that this fishery became about like the line fishery.

On the 6th of March fish were observed at "Islændingen" (the lower part of Sundströmmen). In the following week fishing was carried on here by all kinds of implements; but the catch was extremely irregular, because the weather was unfavorable to the business.

Sörvaagen.—Trawl-line fishing here was somewhat better, net fishing somewhat smaller, than at Sund.

Table LXII shows the catch at the remaining cod fisheries which were of any importance.

TABLE LXII.

Place.	Yield of the cod fisheries in 1880.					
	Fish.			Liver.	Medicinal oil.	Roe.
	Total.	Kinds.				
		Salted.	Dried.			
	1,000 fish.			Barrels.		
Finmarken	23,000	13,500	9,500	3,400	.....	.....
Dverberg	278	44	234	700	24	300
Öksnæs	900	270	630	2,950	.....	1,400
Bö	876	90	786	2,300	.....	1,200
Gimsö	350	20	330	1,100	.....	450
Borge	500	100	400	1,700	.....	700
Væro and Röst	770	330	440	2,060	.....	1,000
"Outside"	3,674	854	2,820	10,810	24	5,050
Skærvö	55	10	45	100	.....	.....
Lyngen	3	.....	3	10	.....	.....
Berg and Torsken	40	40	.....	120	.....	70
Trondenæs	25	10	15	80	.....	30
Tranö	4	3	1	10	.....	.....
Rödö	330	150	180	1,130	.....	560
Herö	64	50	14	250	.....	120
Lurö	300	50	250	700	.....	200
Rest of Nordland and Tromsö	821	313	508	2,400	.....	980
Namdalen	Small	.....	.....	.....	.....	.....
Nordmöre	3,500	.....	.....	7,000	.....	.....
Romsdalen	1,500	.....	.....	*600	950	1,100
Söndmöre	5,800	.....	.....	†12,000		11,000
South Bergenhus	1,250	.....	.....	.....	.....	.....

*Oil. †4,500 barrels of this was medicinal oil.

Table LXIII gives the yield of the winter and spring fisheries for the last five years, and the aggregate export, reckoning 50 fish to the hundred-weight of split cod and 75 of dried cod.

TABLE LXIII.

[In millions.]

Fishery.	Yield of the winter and spring fisheries.									
	1875.		1876.		1877.		1878.		1879.	
	Split cod.	Dried cod.	Split cod.	Dried cod.	Split cod.	Dried cod.	Split cod.	Dried cod.	Split cod.	Dried cod.
Finmarken	9.9	9.8	2.2	3.1	8.9	8.6	6.3	5.6	11.2	7.4
Nordland & Tromsö	16.5	23.2	19.9	20.7	28.3	25.7	.....	.....	22.5	19.4
Namdalen	0.8	.....	0.9	.....	1.5	.....	0.4	.....	0.3	.....
Fosen	1.3	.....	0.9	.....	1.3	.....	0.9	.....	0.8	.....
Nordmör	2.5	.....	1.7	.....	2.7	.....	2.4	.....	2.0	.....
Romsdalen	0.9	.....	0.5	.....	0.9	.....	0.9	.....	0.9	.....
Söndmör	2.8	.....	1.8	.....	4.3	.....	3.0	.....	5.0	.....
Sönd & Nordfjord	0.5	.....	0.2	.....	0.3	.....	0.4	.....	.....	.....
Söndre Bergenhus	.....	.....	.....	.....	.....	.....	0.03	.....	.....	.....
Stavanger	.....	.....	.....	.....	.....	.....	0.03	.....	.....	.....
Total	35.2	33.0	28.1	23.8	48.2	34.3	.....	.....	42.7	26.8
Exported	36.8	31.3	33.0	29.5	45.9	31.7	41.0	24.0	44.7	31.0

Tables LXIV to LXXII show the export of cod from Norway, Canada, St. John's (Newfoundland), the United States, Iceland, France, Scotland, and Holland from 1872 to 1878. Thus from the fish-exporting places returns are wanting from St. Pierre and Miquelon (Newfoundland) and the Faroe Islands only.

In the report for last year the export from Canada in 1876 is erroneously stated.

In the United States the fiscal year is reckoned from July 1 to June 30. In the other places, on the contrary, from January 1 to December 31.

In the Scotch fishery statistics it is not stated specially to what country the export was made. After comparing it with the English trade statistics, I believe that I have committed no important error in stating that the export to "the continent" went exclusively to Spain, and that to "places outside of Europe" to the British West Indies.

For Iceland, no official statistics are known to me, and I have taken as the basis of my calculation the export to Denmark and statements from a private individual for 1878 and 1879. According to an article by Hen. M. Lindeman, in Dr. A. Petermann's Mittheilungen, 60th part, the total export was:

	Split cod.	Dried cod.
	Pounds.	*Pounds.*
1873	6,500,000	230,000
1874	8,700,000	270,000
1875	5,900,000	190,000

My estimate was too high.*

* The fact that I have not undertaken any corrections in the tables is owing to their having been worked out last autumn, and I have not had time to change them, since it was necessary for me to finish my report as early as possible, in order to be able to attend the fishery exhibition at Berlin before its close.

Nor am I in possession of any official statistics for the Faroe Islands. According to the author named above, the export was—

	Split cod.	Dried cod.
	Pounds.	*Pounds.*
1868	1,700,000	150,000
1869	2,200,000	170,000
1870	3,700,000	140,000
1871	3,300,000	30,000
1872	2,900,000	20,000
1873	2,900,000	80,000
Average	2,780,000	100,000

or not quite one and one-half million fish (1,465,000) yearly, one-third of which were shipped to Denmark.

From Belgium was carried on a not unimportant bank fishery in the North Sea, though of late years not to the same extent as formerly. The catch, which for the most part was consumed within the country itself, was—

	Barrels.
In 1872	10,400
In 1873	11,500
In 1874	11,300
In 1875	9,700
In 1876	9,200
In 1877	9,400
In 1878	9,200
In 1879	7,600

An average of 9,800 barrels, or about one-half million fish yearly.

The export from Newfoundland must be greater than is given in the tables from St. John's. According to a statement received during the negotiations on the occasion of the fishery treaty between the United States and Canada the amount exported from the region extending from the Rameau Islands to Cape Race, and therefrom northward to Twillingate, was, in

	Quintals.
1868	829,000
1869	791,000
1870	915,000
1871	928,000
1872	847,000
1873	983,000
1874	1,183,000

An average of 925,000 quintals. For the last three years the average was 1,004,000 quintals, or 102,400,000 pounds, while the export from St. John's for the same time is given by the Commercial Journal as 76,300,000 pounds; the difference, 26,100,000 pounds, must have been sent out from other places on the coast. Since this discrepancy is considerable, and since Newfoundland competes with Norway in the English, Spanish, Portuguese, and Italian markets, the accuracy of the statement has considerable importance for Norwegian exporters, wherefore I ven-

ture to ask that inquiry may be made through the consulate as to whether and to what extent there is opportunity to obtain statements of Newfoundland's total export.

According to French reports the participation of St. Pierre and Miquelon in the Newfoundland fishery has increased not inconsiderably. I have, however, seen no report of the amount exported, wherefore I venture to beg that information in this respect may also be procured, so far as these places are concerned, through the consulate in Quebec.

The yield of the French fisheries is, for the greatest portion of the amounts given, from the weight of fish in salt. The bulk of the exported portion, however, is dried.

The yield of the fishery of the United States for 1876 and 1879 is stated to be only one-half that of the two preceding years. To judge from the number of incoming fishing vessels the reports for 1876 and 1877 cannot be correct.

TABLE LXIV.

[Times 100,000 pounds.]

Where to.	Export of split cod from Norway.								
	1872.	1873.	1874.	1875.	1876.	1877.	1878.	Average.	1879.
Great Britain and Ireland	24.0	16.2	21.3	40.5	43.9	58.3	20.3	32.1	38.7
Hamburg and Bremen	20.7	24.9	25.5	36.2	33.1	66.1	63.6	38.6	62.1
Portugal	41.2	27.1	16.1	55.3	58.7	121.7	146.6	66.7	105.4
Spain	465.5	422.2	463.7	515.9	474.2	582.8	531.8	493.7	643.9
Italy and Austria	1.7	0.9	0.7	19.8	10.6	29.4	18.1	11.6	17.5
Holland	0.7	1.0	0.2	0.7	0.7	1.0	0.4	0.7	0.5
West Indies	39.9	54.2	63.9	43.4	35.1	50.5	32.0	45.6	23.1
Brazil	13.1	10.9	5.9	19.5	.....	3.9	3.2	8.1	.....
Other countries	12.9	2.1	2.2	5.3	4.5	3.5	3.4	4.8	2.3*
Total	619.7	559.5	599.5	736.6	660.8	917.2	819.4	701.8	893.5
Million fish, estimating 50 per hundred-weight.	31.0	28.0	29.8	36.8	33.0	45.9	41.0	35.1	44.7

*To France 1.8; to Denmark 0.2.

TABLE LXV.

[Times 100,000 pounds.]

Where to.	Export of dried cod from Norway.								
	1872.	1873.	1874.	1875.	1876.	1877.	1878.	Average.	1879.
Sweden	69.0	70.9	64.4	70.6	79.6	80.2	63.2	71.1	45.1
Denmark	3.9	4.8	9.1	7.5	5.2	8.5	7.9	6.7	1.7
Great Britain and Ireland	6.1	3.8	4.1	5.2	4.5	3.1	4.2	4.4	7.2
Russia and Finland	21.2	25.4	30.5	38.9	34.3	26.4	32.1	29.8	28.3
German ports on the Baltic	0.8	1.9	2.6	1.4	1.0	1.0	2.0	1.5	0.9
Hamburg and Bremen	3.3	4.8	4.1	7.0	6.0	6.1	6.0	5.3	13.1
Holland	48.3	69.5	57.0	61.5	71.1	59.5	57.0	60.6	67.6
Belgium	15.9	22.0	19.2	24.4	18.9	21.6	14.7	19.5	18.1
France	1.0	3.3	.....	3.3	3.0	4.7	4.3	2.8	2.0
Spain	4.5	3.8	16.7	9.1	1.2	6.1	12.6	7.7	7.6
Italy and Austria	173.0	151.2	176.8	187.4	166.8	205.1	114.4	167.8	220.0
United States	.....	0.2	0.2	0.5	0.1	0.1	0.6	0.2	0.8
West Indies	0.3	0.5	0.8	0.5	0.5	0.1	0.6	0.5	0.4
China	2.6	5.2	.....	.....	.....	.....	.....	1.1	.....
Other countries	0.5	0.6	0.1	0.1	1.4	0.1	0.7	0.5	.....
Total	350.4	367.9	385.6	417.4	393.6	422.6	320.6	379.7	412.8
Million fish, estimating 75 per hundred-weight.	26.3	27.6	28.9	31.3	29.5	31.7	24.0	28.5	30.9

TABLE LXVI.

[Times 100,000 pounds.]

Where to.	Export of split cod from Canada.								
	1872.	1873.	1874.	1875.	1876.	1877.	1878.	Average.	1879.
Great Britain and Ireland	21.9	26.5	32.7	20.1	10.7	17.9	18.0	21.1	40.1
Portugal	20.2	31.1	35.5	8.0	14.0	12.2	10.7	18.8	24.0
Spain	5.4	5.5	.....	.....	.....	.....	.....	1.8	.....
Italy	52.2	43.6	45.5	38.9	31.7	35.1	33.5	36.2	42.8
Austria					.....	2.3	2.3	.....	2.3
United States	19.9	47.6	70.6	44.7	43.2	91.1	87.5	57.8	82.2
Newfoundland	.....	.....	.....	1.2	7.3	1.2	18.2	4.0	6.3
British West Indies	.....	.....	.....	.....	216.2	263.2	265.9	.....	.....
Spanish West Indies	.....	.....	.....	.....	154.9	189.6	181.5	.....	.....
French West Indies	.....	.....	.....	.....	51.2	42.7	55.9	.....	.....
Hollandish West Indies	544.5	474.3	544.4	512.1	.....	0.1	0.1	504.7	583.7
Danish West Indies	.....	.....	.....	.....	5.4	3.1	4.8	.....	.....
Hayti	.....	.....	.....	.....	11.7	7.3	4.3	.....	1.6
Guiana	.....	.....	27.9	.....	31.8	32.7	25.5	16.8	29.5
South America	39.3	28.8	36.7	44.1	59.0	71.8	78.4	51.3	68.6
Madeira	.....	.....	.....	.....	3.0	6.4	3.4	1.8	0.3
Africa	.....	.....	.....	.....	0.3	0.1	.....	.....	.....
Other countries	4.5	11.6	4.0	2.6	1.5	.....	.....	3.5	.....
Total	707.9	690.6	797.3	671.7	641.9	776.8	790.0	725.2	881.4*
Million fish	35.4	34.5	39.9	33.6	32.1	38.8	39.5	36.3	44.1
Catch	41.0	44.9	40.7	38.1	42.3	41.6	46.0	42.1	57.3

493.4 | 506.00 | 512.5

*315.6 of these in the first 6 months, 565.8 in the last 6 months.

TABLE LXVII.

[Times 100,000 pounds.]

Where to.	Split cod exported from St. John's.								
	1872.	1873.	1874.	1875.	1876.	1877.	1878.	Average.	1879.
Great Britain and Ireland	24.5	47.7	42.3	24.9	24.9	43.0	39.4	35.4	48.3
Portugal	87.1	85.2	109.4	104.7	87.9	67.8	89.6	90.2	125.0
Spain	180.8	236.2	222.6	134.5	156.6	112.4	79.5	160.4	138.1
Italy	10.1	13.7	49.0	25.9	27.3	22.7	30.3	25.6	43.2
United States	8.2	8.6	17.1	3.1	3.8	5.3	10.3	8.1	17.8
Canada	2.3	21.3	15.4	0.5	1.5	.....	2.1	6.2	7.1
British West Indies	68.4	75.1	91.9	67.4	58.3	66.5	50.4	68.3	57.6
Brazil	221.3	235.8	285.5	244.5	204.7	265.1	242.0	242.7	346.6
Other countries	35.2	43.6	51.5	49.3	13.3	26.1	19.7	34.1	15.3
Total	637.9	767.2	884.7	654.8	578.3	609.0	563.3	670.7	799.0
Million fish, estimating 50 to a hundred-weight.	31.9	38.4	44.2	32.7	28.9	30.4	28.2	33.5	39.9

TABLE LXVIII.

[Times 100,000 pounds.]

Where to.	Export of dried and smoked cod from the United States.											
	1876.			1877.			1878.			Average.		1879.
Great Britain and Ireland					0.4			1.1				9.9
Hamburg					0.1							
Newfoundland and Labrador			2.7			11.8			25.6		19.6	0.4
Canada			21.3									18.6
Columbia			1.9									2.0
West Indies:												
Honduras and British West Indies			3.8									6.5
Danish West Indies		16.5	0.1			15.1			17.0			0.6
St. Domingo			5.1									3.6
Porto Rico		150.4	7.5		143.1			157.2			150.2	132.5 1.3
Hayti			81.5			63.3			94.7			74.0
Cuba			14.5			18.9			7.3			25.7
French West Indies			19.2			20.3			21.6			20.8
Hollandish West Indies			19.1			25.5			16.6			0.4
British Guiana			1.2									0.9
Hollandish Guiana												15.7
Brazil			0.3						0.3		0.2	0.5
South America			1.0			1.8			1.4		1.4	11.0
Other countries						4.9			8.0		4.3	8.2
Total			178.0			161.9			193.6		177.8	200.0
Million fish, estimating fifty to a hundred-weight			8.9			8.1			9.7		8.9	10.0
Yield of the cod fisheries, in hundred-weights			728			735.4			306.1			325.1
Number of fishing vessels arriving						461			732			752
Draught in tons						19,000			26,700			29,900

TABLE LXIX.

[Times 100,000 pounds.]

Year.	Denmark—dried and dry-salted cod.						
	Imported.					Exported.	Consumed.
	Faroe Islands.	Iceland.	Greenland.	Other countries.	Total.		
1872	9.6	21.0	0.4	2.4	33.4	10.2	23.2
1873	8.3	19.7		5.2	33.2	9.2	24.0
1874	8.1	22.8	0.3	6.7	37.9	12.6	25.3
1876	13.9	18.0	0.5	3.0	35.4	7.6	27.8
1877	10.5	35.6		5.5	51.6	13.9	37.7
1878	10.0	35.0					

REMARK. In 1879 there was exported from Iceland 200,000 pounds of dried cod and 12,500,000 pounds of split cod, to the following places:

	Pounds.
Spain	6,850,000
Copenhagen	3,650,000
Great Britain and Ireland	2,000,000
	12,500,000

From the Faroe Islands were exported in 1879 2,000,000 pounds of split cod and 100,000 pounds of dried cod.

TABLE LXX.

[Times 100,000 pounds.]

Destination.	Salted and dried cod exported from France.							
	1872.	1873.	1874.	1875.	1876.	1877.	1878.	Average.
Great Britain and Ireland	0.1	.....	.....	.....	0.5	.....	.....	0.1
Spain	.....	7.4	.....	3.1	3.2	.....	3.3	2.8
Italy and Austria	43.2	38.4	.....	42.6	37.7	27.2	34.7	37.3
Algiers	7.1	9.8	.....	7.1	9.7	10.6	12.0	9.4
Greece	13.4	15.9	.....	6.8	11.0	3.8	10.3	10.2
Turkey and Egypt	6.8	6.4	.....	4.5	4.0	2.8	3.9	4.7
West Indies	0.3	8.5	.....	1.0	.....	5.7	1.6	2.8
South America	2.8	0.2	.....	.....	.....	.....	.....	0.5
Other countries	3.9	5.4	.....	10.0	3.7	10.6	11.1	7.4
Total	65.6	92.0	114.0	75.1	69.8	60.7	76.9	79.2
Million fish, estimating 50 to a hundred-weight.	3.3	4.6	5.7	3.8	3.5	3.0	3.8	4.0
Yield:								
In salt	615.9	668.2	582.6	558.1	549.1	589.3	673.4	605.2
Dried	148.0	127.8	123.2	87.0	101.0	83.1	81.8	107.4
Other products	18.3	18.9	23.1	22.5	17.5	19.3	22.3	20.3
Total	782.2	814.9	728.9	667.6	667.6	691.7	777.5	732.9

TABLE LXXI.

[Times 100,000 pounds.]

Year.	Split cod, exported from Scotland.				Millions of fish caught.
	Destination.			Total.	
	Ireland.	The Continent (Europe.)	Places outside of Europe.		
1872	.....	.....	.....	53.6	.....
1873	38.4	23.1	8.6	70.1	.....
1874	30.3	21.3	9.4	61.0	4.5
1875	43.5	25.7	12.7	81.9	5.8
1876	28.9	25.0	5.9	59.8	3.5
1877	41.2	23.3	8.9	73.4	6.0
1878	42.9	40.3	11.8	95.0	0.2
Average	37.5	26.4	9.5	70.7	5.2
Millions of fish, estimating 50 per hundred-weight	1.9	1.3	0.5	3.5	.....

TABLE LXXII.

[Times 100,000 pounds.]

Year.	Cod, salted, in barrels, exported from Holland.			Catch, in millions.
	Belgium.	Germany.	Total.	
1872	8.1	4.8	12.9	1.4
1873	10.9	5.9	16.8	1.7
1874	5.4	8.1	13.5	1.4
1875	5.1	6.5	11.6	1.4
1876	10.6	8.3	18.9	1.4
1877	10.8	8.7	19.5	1.7
1878	6.7	5.3	12.0	1.4
Average	8.2	6.8	15.0	1.5
Fish, estimating 17 per hundred-weight	139,400	115,600	255,000	.....

Table LXXIII contains a summary of the annual export. Including the Faroe Islands, the total was 154,500,000 yearly, of which 28,500,000 was dried cod, and 126,000,000 split cod. Of the whole amount, again, 75,000,000 were caught in European and 79,500,000 in American waters. The amount exported was greatest from Norway, 63,600,000, or 41 per cent.; next from Canada, 36,300,000, or 23½ per cent.; next from St. John's, 33,500,000, or 21¾ per cent.; next from United States, 6,800,000, or 4½ per cent.; next from Iceland, 5,000,000, or 3¼ per cent.; next from France, 4,000,000, or 2½ per cent.; next from Scotland, 3,500,000, or 2¼ per cent.; next from Faroe Islands, 1,500,000, or 1 per cent.; finally from Holland, 300,000, or ¼ per cent.

TABLE LXXIII.

Where from.	Total export in millions.							
	1872.	1873.	1874.	1875.	1876.	1877.	1878.	Average.
Norway: Dried cod	26.3	27.6	28.9	31.3	29.5	31.7	24.0	28.5
Split cod	31.0	28.0	29.8	36.8	33.0	45.9	41.0	35.1
Canada	35.4	34.5	39.9	33.6	32.1	38.8	39.5	36.3
St. John's	31.9	38.4	44.2	32.7	28.9	30.4	28.2	33.5
United States	5.0	5.0	5.0	6.1	8.9	8.1	9.7	6.8
Iceland	4.5	4.5	5.0	5.0	4.0	5.6	5.6	5.0
France	3.3	4.6	5.7	3.8	3.5	3.0	3.8	4.0
Scotland	2.7	3.5	3.0	4.1	3.0	3.7	4.7	3.5
Holland, barreled fish	0.2	0.3	0.2	0.2	0.3	0.3	0.2	0.3
Total split cod	114.0	118.8	132.8	122.3	113.7	135.8	132.7	124.5
Total of fish	140.9	146.4	161.7	153.6	143.2	167.5	156.7	153.0

Table LXXIV gives a summary by weight of the split cod imported, and Table LXXV by number. The amount of dried cod imported is stated in Table LXV. The importation of cod during the last seven years has varied as follows: In the West Indies, 4,900,000 (35,300,000 to 40,200,000); in Spain, 3,600,000 (35,500,000 to 39,100,000); in Brazil, 4,400,000 (10,200,000 to 14,600,000).

In Portugal, Germany, and Denmark the importation has been steadily increasing. In most other countries the amount consumed appears to be tolerably uniform year by year. When the amount imported exceeds the average one year, it falls below it during the next two. The considerable increase in the manufacture of split cod which has taken place in Loffoden of late years, namely, from 10,000,000 to 11,000,000 in the beginning of the seven-year period to double that amount at the end of the period, exceeds by a couple of millions the difference between the lowest and the highest amount imported by the two countries (Spain and the West Indies) which consume three-fifths of the split cod, and one-half of all the cod in other forms which come upon the market.

The exports have varied as follows: From Norway, dried cod, 7,700,000 (24,000,000 to 31,700,000); split cod, 17,900,000 (28,000,000 to 45,900,000); total, 22,000,000 (55,600,000 to 77,600,000). From Canada, 7,800,000

(32,100,000 to 39,900,000); from St. John's, 16,000,000 (28,200,000 to 44,200,000); from United States, 4,700,000 (5,000,000 to 9,700,000); from Iceland, 2,500,000 (3,100,000 to 5,600,000); from France, 2,700,000 (3,000,000 to 5,700,000); from Scotland, 2,000,000 (2,700,000 to 4,700,000); from various countries, 26,600,000 (140,900,000 to 167,500,000).

TABLE LXXIV.

Destination.	Total import (of split cod). Times 100,000 pounds.								
	1872.	1873.	1874.	1875.	1876.	1877.	1878.	Average.	Million fish.
West Indies	751.1	714.7	803.6	751.0	705.6	780.7	765.5	753.2	37.7
Spain	732.7	754.4	772.6	746.2	711.0	781.5	717.9	745.2	37.3
Brazil	234.4	246.7	291.4	264.0	205.0	269.0	245.5	250.9	12.5
Portugal	148.5	143.4	161.0	168.0	160.6	201.7	246.9	175.7	8.8
Great Britain and Ireland	109.1	138.8	138.6	142.0	118.9	173.6	154.7	136.5	6.8
Italy and Austria	107.2	96.6	132.5	127.2	107.3	116.7	118.9	115.2	5.8
United States	28.1	56.2	87.7	47.8	47.0	96.4	97.8	65.9	3.3
South America	42.1	29.0	36.7	44.1	60.0	73.6	79.8	52.2	2.6
Germany	22.3	26.9	28.2	38.4	35.9	69.1	65.4	40.9	2.0
Denmark	30.6	28.0	30.9	35.4	31.9	46.1	45.0	35.4	1.8
British Guiana	.....	.....	27.9	.....	33.0	32.7	25.5	29.8	1.5
Mediterranean	27.3	32.1	24.3	18.4	24.7	17.2	26.2	24.3	1.2
Canada	2.3	21.3	15.4	0.5	22.8	11.8	27.7	14.5	0.7
Newfoundland	.....	.....	.....	1.2	10.0	1.2	18.2	4.4	0.2
Other countries	62.5	68.7	71.1	74.8	28.2	51.6	45.6	57.5	2.9
Total	2298.2	2346.8	2621.9	2459.0	2301.9	2722.9	2660.6	2501.6	125.1
Millions of fish.	114.9	117.3	131.1	122.9	115.1	136.1	133.0	125.1	.....

TABLE LXXV.

[Millions of fish.]

Country.	Total import (of split cod).							
	1872.	1873.	1874.	1875.	1876.	1877.	1878.	Average.
West Indies	37.6	35.7	40.2	37.6	35.3	39.0	38.2	37.7
Spain	36.6	37.7	38.6	37.3	35.5	39.1	36.0	37.3
Brazil	11.7	12.3	14.6	13.2	10.2	13.4	12.3	12.5
Portugal	7.4	7.2	8.0	8.4	8.0	10.1	12.3	8.8
Great Britain and Ireland	5.5	6.9	6.9	7.1	5.9	8.7	6.7	6.8
Italy and Austria	5.4	4.8	6.6	6.4	5.4	5.8	5.9	5.8
United States	1.4	2.8	4.4	2.4	2.3	4.8	4.9	3.3
South America	2.0	1.4	1.8	2.2	3.0	3.7	4.0	2.6
Germany	1.1	1.3	1.4	1.9	1.8	3.5	3.3	2.0
Denmark	1.5	1.4	1.5	1.5	1.6	2.3	2.2	1.8
British Guiana	.....	.....	1.4	.....	1.6	1.6	1.3	1.5
Mediterranean	1.4	1.6	1.2	0.9	1.2	0.9	1.3	1.2
Canada	0.1	1.1	0.8	.....	1.1	0.6	1.4	0.7
Newfoundland	.....	.....	.....	0.1	0.5	0.1	0.9	0.2
Other countries	3.1	3.4	3.6	3.7	1.4	2.6	2.3	2.9
Total	114.8	117.6	131.0	122.7	114.8	136.2	133.0	125.1

Table LXXVI contains a summary of the total import. Of the whole quantity exported, 57,600,000, or 37.4 per cent., went to America; 92,000,000, or 59.9 per cent., to Europe; and 4,000,000, or 2.6 per cent., to unknown places.

The most important markets were: Spain, which received 37,900,000, or 24.7 per cent.; West Indies, which received 37,700,000, or 24.5 per cent.; Italy and Austria, which received 18,400,000, or 12 per cent.; Brazil, which received 12,500,000, or 8.2 per cent.; Portugal, which received 8,800,000, or 5.8 per cent.; Great Britain and Ireland, which received 7,200,000, or 4.7 per cent.; Sweden, which received 5,300,000, or 3.4 per cent.; Holland, which received 4,500,000, or 2.9 per cent.

TABLE LXXVI.

Country.	Total average import from 1872–1878.	
	Millions.	Per cent.
Spain	37.9	24.7
West Indies	37.7	24.5
Italy and Austria	18.4	12.0
Brazil	12.5	8.2
Portugal	8.8	5.8
Great Britain and Ireland	7.1	4.7
Sweden	5.3	3.4
Holland	4.5	2.9
United States	3.3	2.2
South America	2.6	1.6
Germany	2.5	1.6
Denmark	2.3	1.5
Russia and Finland	2.2	1.5
Belgium	1.6	1.0
Mediterranean	1.4	0.9
British Guiana	1.5	0.9
Other countries	4.0	2.6
Total	153.6	100.

I shall furnish, toward the close of the year, to one of our newspapers, tables of export in 1879, just as I did last year. With these statistics, and a general abstract of the year's fisheries as a starting-point, one will have a tolerably accurate basis for judging the state of affairs in 1881. It will, therefore, be very useful if the consuls render, as soon as the fishery in a country ends, and also concerning the autumn cod fisheries, a short report on its results—that is to say, whether it has been unsuccessful, tolerably good, or good. According to the material which lies before us, the exports for 1879 will presumably exceed those of all preceding years. The effects hereof will be traced in 1881, and, since the Norwegian fisheries have given an unusually good yield this year, the prospects of fair prices during the coming Loffoden fishing are not promising, even if the other fisheries should reach the results of an average year.

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VI.—EXTRACTS FROM NORWEGIAN OFFICIAL STATISTICS OF FISHERIES FOR THE YEAR 1880.*

By Boye Strøm, *Clerk.*

As the introduction to the fishery statistics for the year 1878 furnishes a full summary of the results of the Norwegian fishing industry during the decade from 1869 to 1878, I shall on the present occasion confine myself to setting forth the most important data presented by the statistics for 1880 as compared with those of 1879 and with those of the above-named decade.

The total money value of the Norwegian coast fisheries, the fishing for home use excepted, on the basis of the prices paid at the fishing-stations in 1880, was 22,579,000 crowns [$6,051,172]. In 1879 the yield was somewhat less, namely, 21,340,000 crowns [$5,719,120], but in the decade from 1869 to 1878 the average annual yield was 23,211,000 crowns [$6,220,548].

The values here quoted, which represent the annual gross receipts which the industry has yielded the fishermen, are thus divided among the different kinds of fisheries:

Fisheries.	1880.		1879.		Average 1869–1878.	
	Value.	Per cent.	Value.	Per cent.	Value.	Per cent.
Cod	$3,360,452	55.5	$3,666,776	64.1	$3,731,096	60.1
Fat herring	1,534,568	25.4	1,038,232	18.1	1,008,484	16.2
Sprat and other small herring	138,288	2.3	69,948	1.2	90,048	1.4
Great herring	.....	.....	.....	.....	349,472	5.6
Spring herring	230,748	3.8	210,380	3.7	272,556	4.4
Mackerel	186,528	3.1	182,508	3.2	194,300	3.1
Summer fishing for pollock, ling, &c	388,064	6.4	367,428	6.5	406,556	6.6
Salmon and sea trout	102,376	1.7	90,048	1.6	90,048	1.4
Lobster	108,540	1.8	91,656	1.6	75,844	1.2
Oyster	1,608	.....	2,144	.....	2,144	.....
Total	6,051,172	100.0	5,719,120	100.0	6,220,548	100.0

Of the total money value in 1880, the sum of 5,734,000 crowns [$1,536,712] was produced by the cod fishery in the Loffoden inspection district, which sum is a little less than the average result of this fishery, which may be estimated at about 6,500,000 crowns [$1,742,000].

As regards the catch in numbers, the cod fisheries in 1880 furnished a total yield of 68,273,000, which not only considerably exceeds the average of the above-named decade, this having been only 49,200,000,

* *Norges officielle Statistik. Ny Række. Udgiven i Aaret* 1882. *C. No.* 9. *Tabeller vedkommende Norges Fiskerier i Aaret* 1880 *samt Beretninger angaaende deres Drift m. v. Udgivne af det statstiske Central Bureau. Kristiania. I Kommission hos H. Aschehoug & Co.* Translated by Tarleton H. Bean.

but even surpasses the catch of the year 1877, which, until now, was the largest known. The fishery in the Loffoden inspection district yielded 27,500,000, while in 1879 26,300,000 were caught there, and the average annual catch from 1869 to 1878 was about 21,800,000, with, however, a maximum in 1877 of 28,400,000. The fat herring fisheries, which ever since 1876 have been decreasing, and which in 1879 did not yield more than 443,000 hectoliters [1,257,012½ bushels], increased greatly in 1880, and yielded not less than 720,000 hectoliters [2,043,000 bushels]. Of this amount 440,000 hectoliters [1,248,500 bushels] were taken in Loffoden and Vesteraalen inspection districts alone, and the great majority of these—about 420,000 hectoliters [1,191,750 bushels]—were caught in Eidsfjord.

For information concerning the prices of fish at the fishing stations is given the following tabular synopsis:

	1880	1879	1869–'78
Cod fisheries (excepting with capelin)....per 1,000 round fish..	$58 96	$65 39	$84 15
Capelin fishery (for cod)....do....	30 55	37 25	52 26
Fat herring....per hectoliter*..	2 14	2 33	1 54
Sprat and other small herring fishery....do....	64	54	
Spring herring fishery....do....	3 75	2 36	1 49
Mackerel fishery....per 1,000 round fish..	32 43	30 02	30 82
Salmon and sea trout fishery....per kilogram†..	29	28	29
Lobster fishery....per 1,000..	90 05	81 74	‡79 86
Oyster fishery....per hectoliter*..	6 70	6 16	.....

*One hectoliter equals 2 bushels, 3.35 pecks, or 26.417 wine gallons.

†One kilogram equals 2.2046 pounds avoirdupois.

‡In the years 1876–'78.

The number of men engaged in the fisheries in 1880 was as follows: The capelin fishery (for cod) employed 17,084 men against 18,996 in 1879, and 14,200 on the average during the years 1870–1878. In the remaining cod fisheries 63,357 fishermen took part; the number in 1879 was 64,593, and in the decade 1869–1878 the average was about 52,000. In the fat herring fisheries 35,130 fishermen were engaged this year as against 32,476 in 1879. During the years 1876–'78, on the contrary, the number of these fishermen was as high as 41,000.

The average catch which fell to each fisherman for the year 1880, compared with 1879, was as follows.

Fish yield.	Quantity per man.		Money value per man.	
	1880.	1879.	1880.	1879.
Cod fisheries (except with capelin).....	707	708	$41 81	$46 36
Capelin fishery (for cod).....	1,376	923	41 81	34 57
Fat herring fishery....bushels..	58	38.8	43 68	31 89
Mackerel fishery with drag nets.....	1,618	1,948	52 53	58 42

In conclusion, several tables, compiled principally from trade statistics, are given, which show the exportation of fish products since 1856 and the prices obtained for them during the years 1871–1880.

CHRISTIANIA, *September* 29, 1882.

TABLE I.—*Synoptical table of the exports of fish products since* 1856.*

Fish products.	Average amount annually.					Annual amount.				
	1856–1860.	1861–1865.	1866–1870.	1871–1875.	1876–1880.	1876.	1877.	1878.	1879.	1880.
A.—QUANTITY.										
1. Spring herring.....hectl..	518, 300	702, 450	538, 092	84, 181	42, 395	27, 384	19, 256	41, 220	72, 633	51, 480
2. Other herring.....do...	174, 000	235, 946	466, 669	955, 446	735, 313	1, 013, 261	776, 042	744, 101	658, 312	484, 853
3. Anchovies .....do...	386	539	1, 156	2, 521	7, 381	5, 983	4, 565	7, 181	7, 420	11, 755
4. Dried cod.....lbs..	30, 455, 557	29, 386, 657	35, 063, 832	40, 519, 556	42, 670, 831	43, 394, 685	46, 648, 564	35, 329, 927	45, 536, 939	42, 444, 039
5. Split cod.....do...	42, 219, 523	43, 403, 834	57, 463, 450	66, 533, 726	95, 906, 983	72, 835, 685	101, 125, 112	90, 302, 731	98, 510, 699	116, 760, 686
6. Other salted fish....hectl..	70, 980	58, 601	57, 072	80, 625	101, 099	106, 056	109, 679	71, 507	99, 904	118, 348
7. Cod-liver oil .....do...	69, 156	73, 255	99, 318	120, 482	142, 613	111, 933	152, 354	137, 059	143, 165	168, 555
8. Roe .....do...	33, 102	37, 071	42, 777	47, 198	63, 869	52, 435	62, 294	68, 305	58, 682	77, 630
9. Fish guano .....lbs...	146, 606	830, 032	1, 535, 835	4, 415, 483	14, 098, 067	19, 999, 741	12, 509, 782	14, 478, 821	12, 167, 370	19, 334, 121
10. Fresh salmon .....lbs...	26, 455	4, 150, 159	247, 688	411, 489	586, 018	619, 713	571, 542	583, 117	531, 309	624, 409
11. Fresh mackerel, &c. do ..			6, 885, 627	6, 526, 630	3, 965, 573	3, 248, 919	2, 639, 016	4, 038, 166	5, 010, 130	4, 891, 633
12. Smoked salmon.....do.....	6, 894	3, 541	2, 425	2, 094	2, 359	1, 543	992	5, 070	3, 287	897
13. Lobsters.....individuals..	889, 000	1, 464, 000	1, 462, 000	922, 000	1, 086, 000	1, 270, 000	1, 070, 000	1, 081, 000	1, 019, 000	991, 000
SUMMARY.										
1–3. Herring fisheries.....lbs..	131, 647, 689	178, 440, 324	191, 171, 889	197, 985, 867	149, 056, 075	198, 884, 351	151, 193, 171	150, 581, 565	139, 958, 039	103, 863, 243
4–9. Cod fisheries.....do...	109, 094, 631	109, 414, 298	136, 398, 602	164, 566, 004	219, 190, 155	185, 389, 333	229, 819, 850	200, 478, 387	223, 432, 733	257, 830, 472
10–13. Other fisheries.....do...	1, 036, 162	5, 875, 259	87, 632, 850	7, 956, 622	5, 751, 352	5, 270, 427	4, 390, 371	5, 818, 270	6, 668, 415	6, 609, 080
Total pounds	241, 778, 482	293, 729, 881	415, 203, 341	370, 508, 493	373, 997, 582	389, 544, 111	385, 403, 592	356, 878, 222	369, 059, 187	368, 302, 795
B.—VALUE.										
1. Spring herring.....	.....	.....	$1, 983, 548 40	$926, 477 60	$211, 827 20	$136, 010 00	$102, 322 40	$190, 467 60	$330, 926 40	$299, 382 80
2. Other herring.....	.....	.....	1, 673, 579 60	3, 937, 616 80	3, 247, 061 20	5, 007, 874 80	3, 516, 615 60	2, 502, 369 60	2, 960, 676 40	2, 247, 742 80
3. Anchovies	.....	.....	22, 458 40	40, 766 00	116, 365 60	114, 436 00	71, 207 60	93, 880 40	113, 578 40	188, 698 80
4. Dried cod.....	.....	.....	1, 114, 960 40	1, 617, 460 40	1, 610, 680 00	1, 888, 890 80	1, 949, 726 80	1, 318, 238 40	1, 483, 031 60	1, 413, 485 60
5. Split cod	.....	.....	2, 052, 719 20	2, 684, 154 00	3, 627, 058 40	3, 711, 585 60	3, 849, 820 00	3, 397, 068 40	3, 379, 185 20	3, 297, 606 00
6. Other salted fish	.....	.....	89, 110 00	187, 439 20	229, 086 40	284, 482 00	268, 000 00	160, 022 80	216, 892 40	215, 981 20
7. Cod-liver oil	.....	.....	1, 329, 816 00	1, 524, 223 20	1, 484, 854 00	1, 420, 614 40	1, 823, 820 40	1, 474, 187 60	1, 286, 668 00	1, 419, 006 40
8. Roe	.....	.....	394, 281 60	466, 293 20	422, 502 00	536, 670 00	381, 390 80	433, 972 40	344, 406 80	416, 006 80
9. Fish guano.....	.....	.....	30, 927 20	101, 759 60	271, 805 60	246, 690 80	228, 121 60	281, 614 40	256, 100 80	352, 554 00
10. Fresh salmon	.....	.....	44, 273 60	78, 497 20	109, 585 20	105, 458 00	104, 225 20	113, 417 60	103, 340 80	121, 457 60
11. Fresh mackerel, &c	.....	.....	132, 258 00	151, 259 20	103, 689 20	89, 458 40	77, 318 00	100, 902 00	126, 924 80	123, 789 20
12. Smoked salmon	.....	.....	482 40	482 40	562 80	375 20	241 20	1, 232 80	804 00	214 40
13. Lobsters.....	.....	.....	78, 282 80	75, 870 80	112, 211 60	129, 363 60	100, 339 20	115, 910 00	109, 290 40	106, 208 40

TABLE I.—*Synoptical table of the exports of fish products since* 1856—Continued.

Fish products.	Average amount annually.					Annual amount.				
	1856–1860.	1861–1865.	1866–1870.	1871–1875.	1876–1880.	1876.	1877.	1878.	1879.	1880.
SUMMARY.										
1–3. Herring fisheries‡			3,679,586 40	4,310,860 40	3,575,254 00	5,258,320 80	3,690,145 60	2,786,717 60	3,405,181 20	2,735,824 40
4–9. Cod fisheries‡			5,011,814 40	6,581,329 60	7,645,986 40	8,082,933 60	8,500,879 60	7,565,104 00	6,966,284 80	7,114,730 00
10–13. Other fisheries‡			255,296 80	306,109 60	326,048 80	324,655 20	282,123 60	331,462 40	340,360 00	351,669 60
Total			8,946,697 60	11,198,299 60	11,547,289 20	13,665,909 60	12,473,148 80	10,683,284 00	10,711,826 00	10,202,224 00

*In the table are not included the following articles, whose quantity and value in 1871–1880 were:

Export.	Average annual.				Annual.							
	1871–1875.		1876–1880.		1877.		1878.		1879.		1880.	
	Pounds.	Dollars.	Pounds.	Dollars.	Pounds.	Dollars.	Pounds.	Dollars.	Pounds.	Dollars.	Pounds.	Dollars.
Smoked herring	413,671	13,721 60	289,967	11,282 80	60,516	2,358 40	246,584	9,594 40	339,943	13,212 40	255,052	9,916 00
Fish stomachs	3,263	321 60	19,974	2,304 80	13,117	1,286 40	11,243	1,098 80	26,301	3,189 20	18,893	2,974 80
Fish meal	6,658	268 00	4,475	187 60	4,630	187 60	3,968	160 80	9,094	348 40	2,817	107 20

†One hectoliter equals 2 bushels 3.35 pecks, or 26.417 wine gallons.

‡For calculating the weight the following equivalents are used:

	Pounds.
Herring, all kinds, one hectoliter equals 86 kilograms	189.6
Anchovies, one hectoliter equals 84 kilograms	185
Other salted fish in "Foustager," one hectoliter equals 86 kilograms	189.6
Other salted fish in vessels, one hectoliter equals 93 kilograms	205
Cod-liver oil, one hectoliter equals 93 kilograms	205
Roe, one hectoliter equals 120 kilograms	264.5
Lobsters, each equals 0.5 kilograms	1.1

TABLE II.—*Table of export prices* 1871–1880.

Fish products.	Average.		Annual average.				
	1871–'75.	1876–'80.	1876.	1877.	1878.	1879.	1880.
Spring herring ..... per hectoliter..	$4.33	$5.05	$4.97	$5.31	$4.62	$4.56	$5.82
Great herring .....do	4.82	5.49	6.01	5.78	.....	4.82	5.36
Herring .....do	3.06	3.07	3.38	.....	3.00	.....	4.29
Fat herring .....do	3.94	4.60	5.08	4.71	3.47	4.69	5.07
Sprat .....do	1.88	1.83	1.85	1.85	1.57	1.96	1.88
Dried cod ..... per pound..	.04	.038	.044	.041	.038	.033	.033
Split cod .....do	.04	.039	.05	.038	.042	.034	.028
Cod-liver oil ..... per hectoliter..	12.71	10.56	12.69	11.97	10.76	8.99	8.45
Roe .....do	9.91	6.79	10.23	6.12	6.35	5.87	5.36
Fish guano ..... per pound..	.023	.019	.022	.018	.019	.019	.018
Fresh salmon .....do	.192	.19	.17	.18	.194	.194	.194
Fresh mackerel, &c .....do	.023	.027	.028	.029	.025	.025	.025
Lobsters .....per hundred..	8.38	10.34	10.18	9.38	10.72	10.72	10.72
RECAPITULATION.							
Herring fishery.. products per pound..	.022	.024	.027	.024	.018	.024	.027
Cod fishery .....do	.04	.035	.044	.036	.038	.032	.028
Other fishery .....do	.039	.057	.062	.064	.057	.051	.054
Average per pound.....	.03	.032	.035	.033	.03	.029	.028

TABLE III.—*Statement of the number of men engaged in the cod, fat herring, and mackerel fisheries in* 1880, *and of the yield of the combined coast fisheries, excepting the catch for home use, based upon the prices paid at the fishing-stations.*

Fishermen engaged—	
In cod fisheries	80,441
In fat-herring fisheries	35,130
In mackerel fisheries	3,719
Value of the coast fisheries:	
Cod	$3,360,526 00
Fat herring	1,534,054 00
Sprat and other small herring	138,343 00
Spring herring	230,700 00
Mackerel	186,558 00
Summer fisheries for pollock, ling, &c*	388,150 00
Salmon and sea trout	102,403 00
Lobster	108,455 00
Oyster	1,506 00
Total	6,051,297 00

TABLE IV.—*Detailed account of the cod fisheries in* 1880, *giving the number of fishermen and boats, and their equipment.*

Total number of fishermen	80,441
Fishermen furnished with—	
Nets only	25,809
Trawls only	16,865
Hooks and lines only	16,806
Both nets and trawls	3,094
Nets and hooks and lines	2,518
Trawls and hooks and lines	12,258
Nets, trawls, and hooks and lines	3,091
Total number of boats	18,475

*Including only the portions sold.

Boats furnished with—	
Nets only	4,156
Trawls only	4,633
Hooks and lines only	4,309
Nets and trawls	725
Nets and hooks and lines	388
Trawls and hooks and lines	3,663
Nets, trawls, and hooks and lines	601

TABLE V.—*A statement of the yield of the cod fisheries in* 1880, *giving the number of fish taken.*

Total catch	68,272,800
Taken by—	
Nets	25,003,000
Trawls	23,989,000
Hook and line	19,281,000
Barrels of livers	166,626
Barrels of roe	60,860
Fish-heads sold	45,578,300

TABLE VI.—*Statement of the yield of the winter and spring cod fisheries in* 1880, *giving the money value and the prices paid at the fishing-stations, from which the value is reckoned.*

Money value:	
Total value	$3,360,525 00
Value of the different products:	
Fish, without liver and roe	2,303,093 00
Livers	674,619 00
Roe	313,633 00
Fish-heads sold	69,180 00
Average price at fishing-stations:	
Of 100 cod	3 38
Of livers, per barrel	4 05
Of roe, per barrel	5 15
Of 100 fish-heads	16
Estimated price of 100 round fish	4 93

TABLE VII.—*Detailed statements concerning the persons, &c., engaged in, and the yield of, the fat-herring fisheries in* 1880, *and of prices paid at the fishing-stations.*

a. Men, &c., engaged in the fisheries:	
Whole number of fishermen	35,130
Division of fishermen:	
Net	17,261
Seine	17,869
Number of boats using nets	6,443
Number of seiners	1,258
b. Yield of the fisheries, and prices:	
Total catch ..... barrels	517,874
Taken in—	
Nets ..... barrels	148,900
Seines ..... do	368,974
Value	$1,534,654 00
Average price per barrel	2 97

TABLE VIII.—*Detailed statements of the operations and the yield of the mackerel fisheries in quantity and value in* 1880, *and of the prices paid at the fishing-stations, from which the value is reckoned.*

Total number of fishermen	3,719
Number using drag-nets	3,477
Number of boats using drag-nets	966
Total number of fish caught	5,743,884
Number caught with drag-nets	5,627,384
Money value of the fishery	$186,558 00
Average price per 100 fish	3 24

TABLE IX.—*Statements concerning the yield of:* 1. *The sprat and other small herring fishery;* 2. *The lobster fishery;* 3. *The salmon and sea-trout fishery, and* 4. *The oyster fishery, in* 1880.

1. Sprat and other small herring:	
Total catch, in barrels	152,898
Money value	$138,343 00
Average price per barrel*	91
2. The lobster:	
Total catch	1,205,616
Money value	$108,455 00
Average price per 100†	9 00
3. Salmon and sea-trout:	
Total catch, in barrels	57,085
Money value	$102,403 00
Average price per barrel*	1 80
4. The oyster:	
Total catch, in barrels	164
Money value	$1,506 00
Average price per barrel†	9 14

*At the fishing-stations. †At the place of capture.

VII.—ON THE EARLY SHAD FISHERIES OF THE NORTH BRANCH OF THE SUSQUEHANNA RIVER.*

By Harrison Wright.

History.—There can be no doubt but that the Indians, for years before the white people thought of settling at Wyoming, caught their shad there in large quantities. Their net-sinkers, though they have for years been collected by archæologists, are still very plenty, and can be found anywhere on the flats along the river in quantities, and the fragments of pottery show unmistakable markings with the vertebræ of the shad. These, together with the fact that the early settlers saw the Indians catching shad in a seine made of bushes (called a bush-net), point to the fact that shad on the North Branch were taken in quantities by the Indians.

The Connecticut people who settled here over a hundred years ago had, in the very start, their seines, and took the shad in numbers. As near as we can learn they were the first white people who seined the shad in the North Branch.

During the thirty years' war which the Connecticut settlers had with the Pennsylvania government for the possession of this valley of Wyoming the shad supply was a great element of subsistence. For this, unlike the fields, barns, and granaries, couldnot be burned by the Pennamites.

An old settler says: "When we came back to the valley we found everything destroyed, and the only thing we could find to eat were two dead shad picked up on the river shore; these we cooked, and a more delicious meal was never partaken of by either of us." One of the most bitter complaints made against the Pennamites, in 1784, was that they had *destroyed the seines.*

After the Revolutionary war had ended, and the troubles between the Pennsylvania claimants and the Connecticut settlers had been quieted, the shad fisheries increased in numbers and value yearly, until about the year 1830, when the dams and canal were finished and an end put to the shad fisheries.

Run.—It would appear from the statements hereto appended that the male fish preceded the female fish by some eight to ten days in their

* This paper is condensed from the report of a committee of the Wyoming Historical and Genealogical Society, Harrison Wright, chairman (Wilkes-Barre, Luzerne Co., Pa.), which was published in the Fish Commission Bulletin for 1881, p. 352.—C. W. S.

ascent of the river, and between the ascent of the former and that of the latter there was generally a perceptible rise in the river, and immediately following it came the large roe-weighted females in great schools.

A map of the Susquehanna River from the junction of the West Branch at Northumberland to Towanda, near the New York State line, has been prepared. Upon this are noted the localities of the fisheries with as much accuracy as was attainable from the accounts received by us. Some have probably been omitted, especially in the stretch of river from Danville to a point four miles above Bloomsburg, where we were unsuccessful in our inquiries.

At Northumberland, or just below, was Hummel's fishery; between Northumberland and Danville there were eight fisheries, in order from Northumberland up as follows: 1. Line's Island lower fishery; 1. Line's Island middle fishery; 3. Smith's fishery; 4. Line's Island upper fishery; 5. Scott's fishery; 6. Grant's fishery; 7. Carr's Island fishery; 8. Rockafeller's. The next fishery of which we have a record was the fishery of Samuel Webb, located about four miles above Bloomburg. Above this point about four miles, and six miles below Berwick, was the fishery of Benjamin Boon; the next was located just above the town of Berwick, and about a mile and a half above Berwick was the Tuckahoe fishery (this last is the same as the Nescopeck fishery mentioned in Pearce's history); the next was at Beach Haven. Between this latter place and Nanticoke Dam there were three, viz, one at Shickshinny; one just below the mouth of Hunlock's Creek, and one, called the "Dutch" fishery, on Croup's farm. Above Nanticoke there was one belonging to James Stewart, about opposite Jameson Harvey's place, one at Fish Island, and one at Steele's Ferry, called the Mud fishery. The next was on Fish's Island, three-quarters of a mile below the Wilkes Barre bridge; the next was Bowman's fishery, immediately below the Wilkes Barre bridge; the next was the Butler fishery, a little above the bridge; the next was at Mill Creek, a mile above the bridge; the next was the Monocacy Island fishery; the next Carey's; the next was on Wintermoot Island, this last landing on the left bank above the ferry at Beauchard's; the next was at Scovel's Island, opposite Lackawanna Creek; this and the Falling Spring fishery next above belonged to parties living in Providence, away up the Lackawanna. The next above was at Harding's, in Exeter Township; the next above was at Keeler's, in Wyoming County; the next was at Taylor's (or Three Brothers,) Island; this latter fishery was no doubt the one referred to by P. M. Osterhout as being opposite McKune's Station, on the Lehigh Valley Railroad; the next was at Hunt's Ferry, *circa* five miles above Tunkhannock; the next was Grist's Bar, about a mile above Meshoppen; the next was at Whitcomb's Island, about a mile below Black Walnut Bottom; a half a mile above this fishery was the Sterling Island fishery, and the next above was Black Walnut, and half a mile further up was

the Chapin Island fishery; the next was at the bend at Skinner's Eddy; the next was at Browntown, in Bradford County; the next was at Ingham's Island; the next was at the mouth of Wyalusing Creek; two miles further up was one at Terrytown; the next and last that we have any record of was at Standing Stone, about six miles below Towanda.

Thus it will be seen that between Northumberland and Towanda there were about forty permanent fisheries.

MONEY VALUE.—Our county records only go back to 1787. We spent a whole day in searching the first volumes, in hopes that we might find some entries of transfers of fishing rights, but our search was fruitless. We have, however, found among the papers of Caleb Wright a bill of sale of a half interest in a fishery between Shickshinny and Nanticoke, called the "Dutch fishery." The price paid was £20, "lawful money of Pennsylvania," equivalent to $53.33.*

Jameson Harvey says that Jonathan Hunlock's interest in the Hunlock fishery was worth from five to six hundred dollars per annum; it was a half interest. Henry Roberts says a right in a fishery was worth from ten to twenty-five dollars. Major Fassett's father was one of eleven owners in the Sterling Island fishery, and his interest was valued at $100.

Mr. Hollenback's information on the money value of the different fisheries is by far the most valuable. He says the Standing Stone fishery was worth from $300 to $400 per annum; the Terrytown fishery was worth about the same; the Wyalusing Creek fishery was worth about $250 per annum; the Ingham Island fishery $50 less; the Browntown and Skinner's Eddy fisheries about $150 per annum each.

Jameson Harvey says: "The widow Stewart, at the Stewart fishery, used often to take from $30 to $40 of a night for her share of the haul."

The data bearing upon this point are decidedly unsatisfactory, as they would only give to the forty fisheries an annual value of about $12,000, a large amount for those days, yet one we believe to be too small. The next topic, the "catch," should be taken with this one to form a basis for calculation.

CATCH.—At the eight fisheries near Northumberland large numbers of shad were taken; three hundred was a common haul; some hauls ran from three to five thousand. The Rockafeller fishery, just below Danville (about the year 1820), gave an annual yield of from three to four thousand, worth from 12½ cents to 25 cents apiece.

Mr. Fowler says that the fishery just above Berwick was one of the most productive, and that he has assisted there in catching "thousands upon thousands," but does not give the average annual yield. He also says that at the Tuckahoe fishery "many thousands were caught night and day in early spring," and at the Webb and Boon fisheries the hauls were immense. At the latter they got so many at a haul that they

* Caleb Wright's son received as his share of one night's fishing at this fishery 1,900 shad.

couldn't dispose of them, and they were actually hauled on Boon's farm for manure.

At Hunlock's fishery the annual catch must have been above ten thousand. At the Dutch fishery in one night thirty-eight hundred were taken. At the Fish Island fishery, at a single haul, nearly ten thousand shad were taken. Mr. Jenkins recollects of seeing a haul at Monocacy Island—just before the dam was put in—of twenty-eight hundred. At Scovel's Island the catch was from twenty to sixty per night; at Falling Spring fifty to three hundred per night; at Taylor's Island from two hundred to four hundred per night. At Wyalusing the annual catch was between two and three thousand, and at Sanding Stone between three and four thousand. The daily catch at the Terrytown fishery was about one hundred and fifty. Major Fassett says that at the Sterling Island fishery "over two thousand were caught in one day in five hauls."

It is a plain deduction from the above facts that the fisheries down the river were much more valuable than those above. Above Monocacy we hear of no catch over two thousand, while below that point they were much larger; and while from three to four hundred dollars seems to be the general annual value above, we find the fishery at Hunlock's, 12 miles below, was worth from a thousand to twelve hundred per annum. The shad farther up the river appear to have decreased in numbers, yet to have increased in size, and that brings us to the next head.

SIZE.—The opinion seems to be general that the great size attained by the Susquehanna shad was attributed to the long run up the fresh water stream (carrying the idea of the survival of the fittest). That they were of great size is beyond doubt; nearly every one who recollects them insists on putting their weight at almost double that of the average Delaware shad of to-day.

Mr. Van Kirk gives as the weight of the shad caught at the fisheries in Northumberland and Montour Counties as from three to nine pounds. Mr. Fowler says he has assisted in catching thousands weighing eight and nine pounds at the fisheries in Columbia County. Mr. Harvey, speaking of the Luzerne County shad, says: "Some used to weigh eight or nine pounds, and I saw one weighed, on a wager, which turned the scales at thirteen pounds!" Major Fassett, speaking of those caught in Wyoming County, says: "The average weight was eight pounds, the largest twelve pounds." Dr. Horton says of the shad caught in Bradford County, that he has seen them weighing nine pounds; ordinarily the weight was from four to seven pounds.

PRICE.—The price of the shad varied, according to their size, from 4*d.* to 25 cents, depending of course upon their scarcity or abundance, and as some of our correspondents remember the price in years when it was high, and others in those when there was a great plenty of fish, there arises what appear to be conflicting statements in their letters.

At the town meeting held at Wilkes Barre, April 21, 1778, prices

were set on articles of sale, *inter alia*, as follows: Winter-fed beef, per pound, 7*d.*; tobacco, per pound, 9*d.*; eggs, per dozen, 8*d.*; shad, apiece, 6*d.* At one time they brought but 4*d.* apiece. A bushel of salt would at any time bring a hundred shad. At the time the dam was built they brought from 10 to 12 cents. On the day of the big haul Mr. Harvey says they sold for a cent apiece (Mr. Dana says 3 coppers). Mr. Isaac S. Osterhout remembers a Mr. Walter Green who gave twenty barrels of shad for a good Durham cow. Mr. Roberts says that in exchanging for maple sugar one good shad was worth a pound of sugar; when sold for cash shad were worth 12½ cents apiece. Major Fassett says the market price of the shad was $6 per hundred. Dr. Horton says the shad, *according to size*, were worth from 10 to 25 cents. Mr. Hollenback, in calculating the value of the fisheries near Wyalusing, has put the value of the shad at 10 cents apiece. In 1820 they were held in Wilkes Barre at $18.75 per hundred. Mr. Fowler says they were worth 3 cents or 4 cents apiece.

COUNTRY SUPPLY AND TRADE.—Every family along the river having some means had its half barrel, barrel, or more of shad salted away each season, and some smoked shad hanging in their kitchen chimneys; but not only those living immediately along the river were the beneficiaries, but the testimony shows that the country folk came from fifty miles away to get their winter supply, camping along the river's bank, and bringing in payment whatever they had of a marketable nature. They came from the New York State line, and from as far east as Easton, bringing maple sugar and salt, and from as far west as Milton, bringing cider, whisky, and the two mixed together as cider royal, and from down the river and away to the south towards Philadelphia, bringing leather, iron, &c.

Mr. Isaac S. Osterhout says when quite a boy (1822–'23) he went with a neighbor to Salina, N. Y., after salt, he taking shad and his neighbor whetstones, which they traded for salt. The teams hauling grain to Easton brought back salt. In good seasons the supply of this latter important item always seems to have been short of the demand.

The shad, as far as we can learn, appear never to have gone up the West Branch in such quantities as they did up the North Branch, and the same may be said of the Delaware, or else the fish were of inferior quality, for the dwellers from the banks of both of these streams came to Wyoming for their supply of shad.

Mr. P. M. Osterhout tells of a firm (Miller & McCord) living at Tunkhannock which did quite an extensive business in shad, sending the cured ones up the river into New York State, and far down the river.

Mr. Fowler says: "No farmer or man with a family was without his barrel or barrels of shad the whole year round. Besides furnishing food for the immediate inhabitants, people from Mahantango, Blue Mountains, and, in fact, for fifty miles around, would bring salt in tight barrels and trade it for shad."

Mr. Harvey says: "Boats coming up the river used to bring leather, cider, whisky, cider royal, salt, iron, &c., and would take back shad."

OTHER FISH.—We do not find that any other deep-sea fish (with the exception of eels) ever came up the river above Northumberland. The "Oswego bass," "Susquehanna salmon," "yellow bass," "striped bass," "Susquehanna bass" spoken of by the different correspondents appear to be the same fish, which is also sometimes called the wall-eyed pike, an excellent fish introduced into the river many years ago from Oswego Lake. They are not now as plenty as formerly, though within the past few years they have been increasing perceptibly. The other fish mentioned are nothing but the common river fish.

EFFECT OF DAMS.—There is no question that the building of the dams necessary to feed the canals put a stop at once to shad fishing; all our correspondents agree that after the Nanticoke dam was finished, in 1830, no shad were ever caught above it. As to the effect of the dams on the shad fishing, the following extracts from Hazard's Register are of interest:

1829, May 9, page 304. "Lewistown, Pa., May 2. It is stated that shad are caught in much greater abundance below the dam at North Island, in the Juniata, than has ever been known at any previous time. It is supposed that the dam in the Susquehanna immediately above the mouth of the Juniata has the effect of directing their course up the Juniata. The dam at North Island retards their farther passage, and the consequence is that the people farther up the Juniata are deprived of the luxury of fresh shad, which so abundantly falls to the lot of their neighbors a few miles lower down. But we must be content with these little deprivations by the promise of the immense advantages which are to accrue to the country from the canal."

1830, May 8, page 304. The Sunbury Beacon of Monday the 26th of April says: "Not less than from four to five thousand shad were caught on Saturday last within a quarter of a mile *below the dam*. Upwards of five hundred were taken by one dip-net, and several others averaged two and three hundred each. We understand that several hundred were caught with dip-nets yesterday."

1831, May 14, page 318. From the Wyoming Herald: "Wilkes Barre, May 6, 1831. While the raftsmen complain of the Nanticoke dam, the boys find in it a source of amusement. The bass which ascend at this season in great numbers, stopped by the dam, offer fine sport. Indeed, hooks, half a dozen at a time, without bait, are let down and suddenly drawn up often with two or three bass hooked by the side."

And on the same page, from the Susquehanna Democrat: "A short time since great quantities of bass were caught in a small eddy formed in the river directly below the abutment of the Nanticoke dam. The fish apparently lay there in schools, and by drawing hooks through the eddy numbers were caught. On Thursday and Friday last a number of fine shad were caught in the same way. One man drew out nine in one

day, and sold them for 50 cents each. This is the first instance within our knowledge of shad being caught with a hook. We mention the fact as one altogether new, as well as to say to the down-river folks our market has not been altogether destitute of shad, though many a gentleman's table has."

We are informed that to-day the shad manage to get over the Columbia dam only to be received in nets spread for them at the head of the sluice-way by a pack of scoundrels, among whom, if we hear correctly, are parties connected with our State fish commission. If it were not for this we would have shad in small quantities as far up as the next dam at all events. The cutting off of this staple of food from tens of thousands of people in this section of country could not but be a great loss, and it has been questioned if it was not greater than the benefits derived from the great internal improvements. Some slight improvements in the sluice-way of the lower dams and a regular ladder-way in that of the Nanticoke dam; good protective laws, well enforced (with a double-barreled shot-gun for Columbia dam); certain days set for fishing along the river, and one good stocking with young shad would, we believe, give us shad in fair quantities all the way up the river.

We do not believe the expense would be very great, whereas the benefits would be incalculable. There is no doubt that the experiment is well worth trying. Luzerne County will contribute her share towards the necessary improvements.

WILKES BARRE, *May* 27, 1881.

1. *Statement of Joseph Van Kirk, Northumberland, Pa., May* 25, 1881.

My recollection of the shad fisheries dates back to the year 1820; in that year, and the succeeding two or three seasons, I fished at Rockafeller's fishery, near Danville. In our party there were six of us; we fished with a seine 150 yards long, and caught somewhere from 3,000 to 4,000 marketable shad, weighing from 3 to 9 pounds. At that time there were eight fisheries between Danville and Line's Island, located as follows: Rockafeller's, just below Danville; next Carr's Island; next Grant's fishery; next Scott's, near where my residence was; next Line's Island upper fishery; next Smith's fishery; next Line's Island middle and lower fisheries. At all these points large quantities of shad were caught, and they were sold from 12½ cents to 25 cents apiece. I have heard of hauls containing from 3,000 to 5,000, and 300 was a very common haul. People came from 12 to 15 miles for shad, and paid cash exclusively for them.

Salmon, rockfish, pike, eels, suckers, and a general variety of fish were caught in addition to shad, and we always had a ready market for them for cash. No shad have been taken since the canal was built, and all other fish have sensibly decreased since that time.

The cutting off of the shad supply was a great and serious loss to this community, from both a monetary and economic view, since this fish in

its season was a staple article of food, and employed in the taking and handling quite a large proportion of the inhabitants. This industry was wholly abolished by the erection of these dams, and thousands of dollars of capital invested in the business were instantly swept out of existence. The first fishery below this place was known as Hummel's fishery, and its reputation was good. I never fished there myself, but was well acquainted with it by the speech of my neighbors. In fact all of these fisheries were profitable investments, and the loss of them to this section of the country was incalculable. All of the fisheries mentioned above, except Hummel's, were between Northumberland and Danville. Any mention of those good old times brings up a flood of recollections, and the difficulty is, not to remember what occurred in those days, but to sift out what would be useful in this connection.

2. *Statement of Henry Roberts, Falls, Pa., March* 24, 1881.

I reply to your inquiries regarding shad fisheries in the Susquehanna between Tunkhannock and Lackawanna Creeks, that, according to my recollections, the first was at the head of Scovel's Island, opposite Lackawanna Creek; not many shad were caught here, say from twenty to sixty per night. The next was at Falling Spring; same seine as that used at Scovel's Island; the number of shad caught here ran from fifty to three hundred per night. The next, above Falling Spring, was at Keeler's Ferry (now Smith's). This was a small fishery, and only used when the water was too high to fish at other points; the seine was hauled around a deep hole to bring in the shad. The next and only fishery between this and Tunkhannock Creek was at the head of Taylor's Island, or the "Three Brothers;" this was an important fishery; more shad were caught here than could be taken care of, on account of the scarcity of salt. I can speak of this fishery from experience since 1812. The catch per night ran from two to four hundred. The shareholders attended to it as closely as to their farming or other business, as it was our dependence in part for food. Shad were oftener exchanged for maple sugar than sold for cash—one good shad for a pound of sugar; large shad were worth 12½ cents apiece. A right in a fishery was worth from ten to twenty-five dollars. Shareholders made a practice of salting down more or less shad during the season. An incident in connection with shad-fishing presents itself to my mind, related often by my grandmother. A party of Indians returning from a treaty at Philadelphia landed their canoes, came to her house to borrow her big kettle to cook their dinner in. After building the fire and hanging over the kettle they put in the shad, just as they were taken from the river, with beans, cabbage, potatoes, and onions. My grandfather, David Morehouse, one of the early Connecticut settlers, then owned the same farm I now own and occupy. I am now in my eighty-seventh year.

3. *Statement of H. C. Wilson, Mount Vernon, Ohio, March* 19, 1881.

An article in the Union Leader in reference to the old shad fisheries of the Susquehanna River has brought back to my memory many things that happened in my boyhood days, among which were the old fishermen and the knitting of the shad seines. The seines were knit in sections by the shareholders, each one owning so many yards of the net, and each one receiving his share of fish according to the number of yards owned. I lived one year with Mr. Pierce Butler, where I learned to knit seines, and have never forgotten it. We used to knit on rainy and cold days and evenings, and when the sections were all done, Dick Covert, with the help of John Scott, would knit them together and hang the seine, put on the corks and leads; this was considered quite a trick, and but few would undertake the job.

I remember I used to go over on the beach on the line of the Butler and Dorrance farms and help the fishermen pick up the shad, and when the luck was good was always given one to take home. I remember seeing the shad put in piles on the beach, and after they were all equally divided some one would turn his back and the brailman would say, "Who shall have this?" until they all received their share, one pile left out for the poor women. The boats with the seine shipped would row up to the falls, and then hauled out down by the riffles opposite where Dick Covert used to live. I think it was a bad day for the people along the Susquehanna when the shad were prevented from coming up the river; the fish would be worth more to the people than the old canal. You had better buy the canal, put a railroad on the towing-path, burst up the dams, and increase the value of all the flats above the dams, and you would not have as high water at Wilkes Barre, and there would be less damage done to property; then you would have plenty of shad and all other kinds of fish, and then I think you could afford to send some to your friends out West. I got an old fish-dealer here to send to Baltimore for some shad last week, but they had been too long out of water and too far from home to be good. It used always to be said that there were no shad like the old Susquehanna shad.

4. *Statement of Alvan Dana, Kansas City, March* 22, 1881.

I have no remembrance of any shad being taken at or near Sheshequin, but at Wilkes Barre I have seen them caught in seines before any bridge was built there. The nets were drawn out on the north side of the river. I don't remember to what extent was the catch, but I have often heard my mother say that immense quantities were taken in the vicinity of her father's, who lived about a mile below the old "Red Tavern," in Hanover; that at one haul 9,999 were caught; that when they had got all they could procure salt to cure, or sell for three coppers, they gave to the widows and the poor, and hung up their nets, though the shad were as plenty as ever. In 1816 I went to Owego to live, and

there became acquainted with a Mr. Duane, who was one of the men who drew the net. He said the actual number was 9,997, but two more were added to make the figures all nines.

When the Nanticoke dam was built the shad could not come above it, and men were in the habit of fishing there with a three-pronged hook, sinker, and stout line and pole. This was sunk, and after a few minutes quickly jerked up. I caught two in that way; others had better luck; and it was reported that one man caught seventy in one day, but I think a large reduction would come nearer the truth.

Probably E. Blackman, of Pittston, could give some information regarding shad fishing at Towanda and Sheshequin. Jesse Brown, long a resident of Sheshequin, and in his youth a resident of Wyalusing, I think—also Chester Park, of Athens, I presume—could give information upon the subject. The Park family kept the ferry at Athens at an early day. Both of the above named, I think, are over eighty years of age.

I have been examining some old Gleaners of 1811 and 1812, but don't find any of the spring numbers. Some years ago I gave to my son-in-law, L. B. Wyant, of Harford, McHenry County, Illinois, a roll of Gleaners of 1811 for his museum, which he opens at "Kay's Park," on Geneva Lake, Wisconsin, in summer.

5. *Statement of Alvah Fassett, Scottsville, March* 10, 1881.

In regard to shad fishing, I referred to father, and received the following answers: 1st. There were two permanent fisheries, one at Sterling's Island and one below Wyalusing Falls, besides other places where they sometimes fished, viz, Grist's Bar, Chapin's Island. Whitcomb Island was also fishing ground, but not permanent. 2d. Sterling's Island was the best ground. 3d. Over 2,000 were caught in one day at five hauls. 4th. The market price was $6 per hundred. 5th. The average weight was 8 pounds, the largest 12 pounds. 6th. They also caught suckers, yellow bass, and sunsbitches (what we call carp). 7th. None were caught after the canal and bridges were constructed, to my knowledge. 8th. The first fishing was done by the Connecticut people. Father says that in 1806 his father had a share in the Sterling fishery; there were eleven shares, valued at $100 each. Says his father was not much of a fisherman.

5. *Statement of C. Dorrance, Hot Springs, Ark., March* 24, 1881.

1st. "Fix the number of fisheries and their location as far as is now practicable."

My memory carries me back to the fishery at Monocacy Island, the one below the falls, near the mouth of Mill Creek, one at Plymouth (in part a night fishery), one at or immediately below Nanticoke Falls. No dam obstructed the shad at that point then.

The fishery near Mill Creek was regarded as the main or most reliable fishery, as it could be fished at stages of water when some of the others

could not, and much the largest number of shad were taken there, sweeping as the fishermen did from the foot of the falls, nearly the entire river to the bar—drawing out upon the lands of my late father, where it was my business as a lad every evening, after school, to be with horse and wagon to receive our share of shad. No unpleasant duty, for well do I remember as they came sweeping in to the beach, the net in rainbow form. The corks indicating the position where "Captain" Bennett (father of the late John Bennett, esq.), would discharge his men from the sea or large boat with the outer brail, and passing out and along the net, on the discovery would shout, "Here's shad, boys; hold down the lead line; here's shad." True to the word, long before the main body of the net was drawn up to the shore we youngsters would take up the "captain's" cry, as the large shad darted back and forth between the incoming net and the shore. What think you, would not a return of such scenes start a shout from older heads?

2d. "As to the money values or rental of the fisheries."

Of this I have no data from which to form an opinion. As the fisheries were established by the first settlers, joining their limited means with the land owners, forming a company there by common consent to their children, none were rented as far as my knowledge extends. Owners of rights would allow men who had none to fish for them on shares, thus extending the benefits as far as possible. Good feeling pervaded the community in those days.

3d. "Were other fish taken in any considerable quantity; if so, what kinds?"

With the exception of an occasional striped bass, or, as they were then called, "Oswego bass," of large size (supposed to have been introduced to the headwaters of the Susquehanna from that lake), none of value were taken, as the nets were woven for large shad only.

I cannot better illustrate the value and importance of the shad fisheries at that early day to the people on the Susquehanna River than to repeat an anecdote told me long years after by a genial gentleman of New England, who in youth visited my father at his home in Wyoming.

Leaning on the front gate, after breakfast, as the little children were passing to school, each with a little basket, the universal answer from their cheery, upturned little faces was "Bread and shad," "Bread and shad" (corn bread at that).

Had that fish diet anything to do with the known enterprise of that generation? If so, would it not be well to make a strong and united effort to again introduce so valuable an element of brain material. I am greatly pleased that our society is agitating the subject of restoring the shad to the people on the North Branch, not as a luxury for the few, but for all, cheap and faithful, and coming at a season of the year when most desirable as food, for nowhere on this continent were finer shad found than those taken from the North Branch of the Susquehanna River. The long run of the pure, cold, spring-made waters of the Susquehanna made them large, hard, and fat, nowhere equaled.

7. *Statement of Hon. P. M. Osterhout, in the Tunkhannock Republican, April* 15, 1881.

The first shad fishing in the Susquehanna River was by the early settlers of the Wyoming Valley, who emigrated thither from Connecticut. The food of the early emigrants was, in the main, the fish of the streams and the game on the mountains. The first seine in the valley was brought from Connecticut, and upon the first trial, in the spring of the year, the river was found to be full of shad. These emigrants had settlements along the Susquehanna from Wyoming to Tioga Point, now called Athens, and each neighborhood would establish a fishery for their own accommodation. It was generally done in this way: Say ten men (and it took about that number to man a seine) would form themselves into a company for the purpose of a shad fishery. They raised the flax, their wives would spin and make the twine, and the men would knit the seine. The river being on an average forty rods wide, the seine would be from sixty to eighty rods long. The shad congregated mostly on shoals or the point of some island for spawning, and there the fisheries were generally established. Shad fishing was mostly done in the night, commencing soon after dark and continuing until daylight in the morning, when the shad caught would be made into as many piles as there were rights in the seine. One of their number would then turn his back and another would touch them off, saying, pointing to a pile, "Who shall have this?" and "Who shall have that?" and so on until all were disposed of, when the happy fishermen would go to their homes well laden with the spoils of the night. Between the times of drawing the net, which would be generally about an hour, the time was spent in the recital of fish stories, hair-breadth escapes from the beasts of the forests, the wily Indian, or the Yankee production, the ghosts and witches of New England.

As early as 1800 George Miller and John McCord moved from Coxestown—a small town on the Susquehanna about five miles above Harrisburgh—up the river in a Durham boat, and, bringing with them a stock of goods, located at Tunkhannock, where they opened a store. They were both young men and unmarried. In the spring of the year they dealt quite largely in shad, the different fisheries of the neighborhood furnishing them with large quantities for curing and barreling. Shad were plenty but salt scarce. There was no salt except what was wagoned from the cities or from the salt works at Onondaga, N. Y., and it was not unusual that a bushel of salt would purchase one hundred shad—in fact, it was difficult to procure salt to cure them. At this time the German population in the lower counties of the State had not learned the art of taking shad by means of the seine.

There were then no dams or other obstructions to the ascent of the fish up the river, and large quantities of the finest shad in the world annually ascended the Susquehanna, many of them when taken weighing from six to eight pounds each. The distance being so long (about 200

miles) from tidewater to the Wyoming Valley, the flavor of the shad was very much improved by contact with fresh water. The Susquehanna shad were superior to the Delaware, the Potomac, the Connecticut, or the North River shad. The reason generally given was their being so long in fresh water, which imparted to the fish a freshness and richness not found in the shad of other rivers. Then, none but the strong, healthy shad could stem the current and reach the upper waters of our beautiful river.

Miller and McCord cured and put up annually shad for the market. They boated down the river a large quantity for the times, and sold to the people on the lower Susquehanna. They also boated shad up the river as far as Newton, now Elmira; from thence they were carted to the head of Seneca Lake, a distance of twenty miles, and from there were taken to Geneva and other towns in what was then called the lake country, and sold.

There was a fishery on the upper point of the island opposite McKune's Station, on the Lehigh Valley Railroad. This island was known by the early settlers as one of the Three Brothers. There was also an important fishery at Hunt's Ferry, about five miles above Tunkhannock. Here large quantities of shad were caught every spring. This fishery was owned by twenty rights, ten fishing at alternate nights. There was also another fishery at Black Walnut, below Skinner's Eddy. At all these fisheries more or less Oswego bass were caught, called down the river Susquehanna salmon, a most excellent fish, but they are now nearly extinct. The river ought to be restocked with that same species. They are a fine-flavored fish, solid in meat, and grow to 12 or 15 pounds in weight. The late George M. Hollenbeck, esq., of Wilkes Barre, told me that this bass was brought from the Oswego Lake and put into the Susquehanna at Newton, now Elmira. They were called by the old settlers swager bass. Since the building of the dams across the Susquehanna there have been no shad caught above the Nanticoke dam. These dams also largely obstruct the passage of bass and other food fish up river. The Susquehanna is really one of the finest streams for fish in the United States—the water pure, the bottom rocky and pebbly, affording abundant means for spawning and rearing the young fish. The obstruction to the free passage of fish up the river ought to be removed.

Maj John Fassett, of Windham Township, one of the oldest citizens of that town, as was his father before him, was written to on the subject of the early shad fisheries from Hunt's Ferry to Wyalusing. He mentions the one at Hunt's Ferry, also at Black Walnut, and others at different points up the river as far as Wyalusing. He says his father owned a right in the fishery at Black Walnut, which he valued at $100; here were large numbers of shad caught, which were valued at 6 cents each, and would weigh from 6 to 12 pounds each. The largest one he saw weighed was 12 pounds; the writer hereof thought he had got it

pretty steep as to weight, but he was beaten by Jennison Harvey, esq., an old resident of Plymouth, Luzerne County, now of Wilkes Barre, who says that he saw a shad weighed—on a bet—that was caught in the river in the valley, and that it weighed 13 pounds. Some folks will think it a fish story. Harvey has decidedly the advantage of Major Fassett, as he had the last say.

8. *Statement of Gilbert Fowler.*

BERWICK, PA., *February* 23, 1881.

I was born February 23, 1792, in Briar Creek Township, Northumberland County, now Columbia. I write or dictate this letter on my eighty-ninth birthday. I have lived near the Susquehanna River ever since I was born. My knowledge and recollections about the shad fisheries extend from Wilkes Barre to old Northumberland. The first shad fishery near my home was Jacob's Plains. This was located just above the town of Berwick, and one of the most productive fisheries on the river. Here I have assisted in catching thousands upon thousands of the very finest shad, weighing 8 and 9 pounds. The next nearest was Tuckahoe fishery, situated about one and a half miles above Berwick, on the same side of the river. At this place many thousands were caught night and day in early spring. The next was down the river about six miles from Berwick. This was the fishery of Benjamin Boon. At this fishery I have known so many caught that they were actually hauled out by the wagon load on Benny Boon's farm for manure, so plenty were they. The next fishery was that of Samuel Webb, located about four miles this side of Bloomsburg. This was an immense shad fishery. From the banks of the river at this fishery could be seen great schools of shad coming up the river when they were a quarter of a mile distant. They came in such immense numbers and so compact as to cause or produce a wave or rising of the water in the middle of the river, extending from shore to shore. These schools, containing millions, commenced coming up the river about the 1st of April and continued during the months of April and May. There was something very peculiar and singular in their coming. The first run or the first great schools that made their appearance in the early spring were the male shad—no female ever accompanied them. In about eight or nine days after the male had ascended the river then followed the female in schools, heavily laden with eggs or roe. Those were much the largest and finest fish, and commanded the highest price. Those shad that were successful in eluding the seine and reached the hatching ground at the headwaters of the Susquehanna, after depositing their eggs, returned again in June and July, almost in a dying condition, so very poor were they. Many died and were found along the river shore. The young shad would remain at their hatching places till late in the fall, when they would follow the old shad to the salt water. During the summer they would grow from three to four inches in length. The Susquehanna shad constituted the

principal food for all the inhabitants. No farmer or man with a family was without his barrel or barrels of shad the whole year round. Besides furnishing food for the immediate inhabitants, people from Mahantango, Blue Mountains, and, in fact, for fifty miles around, would bring salt in tight barrels and trade it for shad. They would clean and salt the shad on the river shore, put them in barrels, and return home. The common price of shad was three and four cents each. Besides shad there were many other kinds of food-fish. The most noted among them was the old Susquehanna salmon, weighing as high as fifteen pounds. These salmon were considered even superior to the shad and commanded a higher price. They were caught in seines, on hooks and lines, and were the sport to the gigger at night. Nescopeck Falls, directly opposite Berwick, near where the Nescopeck Creek empties into the river, was a noted place for salmon fishing with hook and line. Men standing on the shore with long poles and lines would often, in drawing out the fish, lodge them in the branches of the trees, giving them the appearance of salmon-producing trees. The shad fisheries which I have alluded to were not common property. The owner of the soil was the owner of the fishery, and no one was allowed to fish without a permit. The owners of the fishery also had the seines, and when not using them they would hire them out to others and take their pay in shad. The seiner's share was always one-half the catch. Shad were caught both night and day in seines. At the Webb fishery I have known eleven and twelve thousand shad taken at one haul. These fisheries were always considered and used as a source of great pleasure, value, and profit, and everybody depended on them for their annual fish and table supply. It was considered the cheapest and best food by all. Immediately after the erection of the river dams the shad became scarce, the seines rotted, the people murmured, their avocation was gone, and many old fishermen cursed Nathan Beach for holding the plow, and the driver of the six yokes of oxen, that broke the ground at Berwick for the Pennsylvania Canal. The people suffered more damage in their common food supply than the State profited by her "internal improvement," as it was called. Although eighty-nine years old to-day, I still hope to live long enough to see all the obstructions removed from one end of the noble Susquehanna River to the other, and that the old stream may yet furnish cheap food to two millions of people along its banks, and that I may stand again on the shore at the old Webb fishery and witness another haul of ten thousand shad.

9. *Statement of Nelson B. Hollenback, Wyalusing, March* 14, 1881.

Commencing at Standing Stone, about 10 miles from Wyalusing Village, and reaching down the road from that point to the Wyoming County line, there were five "old shad fisheries," viz:

(1) The Standing Stone fisheries. William Hank, Benjamin Brown, Cornelius Ennis, and Benjamin Bennet owned this. It was a valuable property, worth at that time from three to four hundred dollars a year.

There were from three to four thousand shad caught there annually. They caught no rock or striped bass, sturgeon, or herring there or at other fisheries in this vicinity.

(2) The Terrytown fishery. This was owned by Jonathan Terry, William Dodge, Edmund Dodge, Samuel Wells, and John Taylor, and was of about the same value as that at Standing Stone.

(3) The Wyalusing fishery, owned by John Hollenback, Benjamin Stalford, Joseph Stalford, and John Stalford. This fishery was worth about $250 a year, with a "catch" of from two to three thousand shad.

(4) The next was the "land" fishery at the head of Ingham's Island. Joseph Ingham owned this, and it was worth about $200 a year.

(5) Next was the Brown Town fishery, owned by Humphrey Brown, Allen Brown, and Samuel Brown, and was worth about $150 per annum.

(6) The next and last was called the "Bend fishery," and was located near the line between Bradford and Wyoming Counties. James Quick and James Anderson owned this, and it was worth about $150 a year.

The stoppage to the emigration of shad to this vicinity was a great loss to the people. For nearly two months every year the people for from 15 to 20 miles from the river, were bountifully supplied.

10. *Statement of George F. Horton, Wyalusing, March 3, 1881.*

I spent many a pleasant day in my boyhood with the men who ran the shad fishery in the Susquehanna, near where I now live. This fishery was about two miles above the mouth of the Wyalusing Creek, at the place we now call Terrytown; formerly all was Wyalusing along here. There were other fisheries above and below us, but this the only one I have any personal knowledge of. The proprietors were Jonathan Terry, esq., Maj. John Horton, sr., Maj. John Taylor, Edmund Dodge, Maj. Justus Gaylord, Gilbert Merritt, William Crawford, and William Wigton. Year after year, for a long time, these men operated this fishery, generally taking the month of May and a part of June of each year, always regaling themselves with a little good *old rye*, and having a fine sociable every night when counting off and distributing the shad caught during the day. Occasionally they sent substitutes, but the fishery never changed proprietors. Some seasons they caught largely; others not so many. I well recollect one draught or haul when they caught 500, but ordinarily 20 to 50 at one drawing of the seine was considered good. The average per day, according to the best of my recollection, would be about 150.

People came from the eastern part of the county, then just settling, up to Wyalusing, as far or nearly as far as from Montrose, to buy shad. The trade was quite large. Some of the time maple sugar was quite a commodity, brought down to exchange for shad.

Very few of any other kind of fish except shad were ever caught. Occasionally a striped bass, large pickerel, carp, sunfish, mullet, sucker,

or a bull-head was taken; no small fish, as the meshes of the seine were large enough to let them through.

The shad were worth from 10 to 25 cents each, according to size. I have seen them caught here weighing nine pounds; ordinarily their weight was from four to seven pounds. If we could have that old shad trade here again it would make us all, if not rich, merry again. But very few are now left among us who saw those glorious old fishing days. The fishing for black bass of these days does not begin to compare with those old fishing days.

I can recollect of but one fishery between Wyalusing and Towanda, and only two between Wyalusing and Tunkhannock.

11. *Statement of S. Jenkins, Wyoming.*

The present inhabitants of Wyoming have but a faint idea of the value of fish to the early settlers. They performed as important a part at Wyoming as they have in the history of all new settlements. A careful study of the advance of immigration and the settlement of new regions shows that those settlements have been guided and controlled by the streams and waters in which fish abounded, and hence were made along their shores. Fish furnished the people a plentiful and healthful supply of food, easily attainable, until the forests could be hewn down, clearings made, crops raised, and cattle could increase and multiply.

It is unquestionable that the early progress made in settling up of our country was due in a large measure to the presence of fish, which furnished food in absolute abundance in the midst of desert lands; and it would be as idle to attempt to disparage the value in the economy of those times as it would be to prove the value now beyond the mere mention of the fact.

The fish that attracted the most attention and were the most highly considered in the early times were shad. The knowledge of these excellent fish in the Susquehanna, at Wyoming, has become almost entirely historical, if not entirely so. But few persons now resident at Wyoming have a personal knowledge of the shad fisheries there and their value to the people in the early days, and hence some of the stories told of the immense hauls of them made in "ye olden time" seem to the present generation more fabulous than real.

That we may the better understand the subject I will give extracts from the writings of strangers, and then conclude with an account or two of our own people and what I myself have seen.

In 1779, when General Sullivan passed through Wyoming on his western expedition against the Indians, a portion of his advance were located at Wyoming from May to the last of July. Many of his officers kept diaries, in which they noted their movements from day to day and touched slightly upon such objects of interest as attracted their attention. I will give a few extracts from these diaries relating to fish at Wyoming.

Dr. Crawford in his diary, under date of June 14, 1779, says:

"The river at Wyoming abounds with various kinds of fish. In the spring it is full of the finest shad. Trout and pickerel are also plenty here."

George Grant, under date of June 23, says:

"The Susquehanna River affords abundance of fish of various kinds and excellent."

Dr. George Elmer, under date of 23d June, says:

"Spent chief part of the day in fishing. Salmon, trout, suckers, bass, and common trout are plenty in the river, of which we catched a number with a seine."

Daniel Gookin, under date of 28th June, says:

"The river Susquehanna, on which this lies, abounds with fish. Shad in great plenty in the spring, as they go up to spawn. The shores are covered with these fish which have died up the river, through their too long stay in fresh water."

There were some twenty-five or thirty what we called shad fisheries within the bounds of old Wyoming. Every available point for casting out and hauling in a seine on the beach, whether on an island or on the mainland, was used as a fishery, and had its owners and its seine. The average number of shad taken at each of these fisheries in a season was from 10,000 to 20,000, beside other fish which were caught before and after the shad made their migration.

It is given on good authority that 10,000 were caught at one haul at the Stewart fishery, about midway between Wilkes Barre and Plymouth, about 1790. This was called the widows' haul.

The settlements, after the massacre of July 30, 1778, had so many widows and fatherless children among them that they made special provisions of bounty for them on many occasions, which were wrought out in such a way as neither to give offense nor to convey a sense of undue obligation.

Among the arrangements of this character was that of giving one of the hauls at each fishery every year, to the widows and fatherless of the neighborhood, and hence called the widows' haul. By common consent it was agreed that the widows should have a haul made of the first Sunday after the season of shad-fishing commenced, and they were to have all caught, whether more or less.

This big haul was made on Sunday.

At the rate I have given, which is made up more from general information upon the subject than from statistics, the number of fish caught annually was about a half a million, which at 30 cents each would make $150,000.

Were the Susquehanna as well stocked with shad to-day as it was a hundred years ago our keen and hungry fishermen would easily double the catch, and still, like Oliver Twist, "cry for more."

I recollect seeing, in the spring of 1826, a haul made in a cove at the

lower end of Wintermoot Island, west side, numbering 2,800 shad. When thrown out they whitened a large space upon the shore.

Being the first haul of the season, the fish were largely distributed among the people, and even after that my grandfather had a half barrel for his right as owner of the seine and fishery.

About 1831 or '32, in the fall, an unusual catch of eels was made in a weir on the east side of Wintermoot Island. During one day and night 2,700 of them were caught, while many escaped from want of means to handle them and take them away as fast as they came in. Another day and night 900 of them were caught, when the basket floated off with the high water.

I herewith give you copies of two papers in my possession bearing upon the shad-fishery question. It will be seen by one of them that the price of shad in the early times was 4*d.* or 4⅓ cents each; quite a different price from what they sell at in our day. Tear the dam from the Susquehanna and we shall have plenty of shad, if not at 4*d.* each:

"Be it known that I, Peter Shafer, have sold all my right in and unto all my right in the Dutch fishery, so called, below the Nanticoke Falls, so called; for and in consideration thereof I, Jacob Cooley, do promise to deliver Seventy shad, unto William Miller, on account of me, the said Peter, on or before the 20th May instant; or otherwise settle with said Miller for what I am indebted for my part of said Seine, and likewise the said Cooley is to deliver Six gallons of Whiskey unto the said Peter, between this date and *Weat* harvest.

"Witness our hands this 14th day of May, 1800.

"PETER SHAFER.
"JACOB COOLEY."

"James Fox holds an order for 725 shad drawn by George Frazer on James Stewart, date April 27.

(Indorsed on the back in these words:) Credit for 350 shad received by me. David Morgan.

(Indorsed:) Copy of Frazey's order. Henry Thomas charges the Estate with 4*s.* 8*d.*, paid in Rye. Paid.

No. 40—725 shad, less received, 350, leaves 375 shad, at 4*d.*=125*s.*=£6 5*s.*, or $16.67. Add interest on same $9.50=$26.17. (£=$2.67.)

12. *Statement of Elisha Blackman, Pittston, March* 22, 1881.

I see that G. Fowler, of Berwick, tells a *big fish story.* I incline to think, however, that it is true. I recollect when I lived with my grandfather, in what is now South Wilkes Barre, perhaps 1798 or 1799 of last century, the great haul of shad at Nanticoke was made. I believe there were nine or ten thousand taken. A number of seines were engaged in it, and lawsuits were the consequence. Salt was scarce and dear. Northampton men came with pack-horses loaded with salt, and returned loaded with shad. I bought and kept the public house that had been

kept by John Courtright on the Plains, Wilkes Barre Township, in the spring of 1815. There were then two fisheries between us and the Pittston Ferry—one at Monocacy Island landing, on the shore of Mr. Samuel Cary's land, the other starting at or near the Wintermoot Island and landing above the ferry at Blanchard's. That season I got my supply at the upper fishery; the first day's attendance was a "blank" day—few or no fish. The large schools of Mr. Fowler's times were dwindled greatly, undoubtedly because of the numerous fisheries that existed below, and the destruction of the young shad by the many eel-weirs in their descent to the ocean in the fall. My time was too valuable to attend on blank days. I left money with Mr. Joseph Armstrong, and he sent me my supply when successful. The next season (1816) the difficulty that had existed between the fishermen at Monocacy (twelve in number) and Mr. Cary, the owner of the land, was settled by giving him the thirteenth share, and ever after I got my supply from the fishery until the canal dams cut off our supply totally. It was a serious damage and inconvenience to us, as markets for fish and meat did not exist then as now. The Susquehanna shad had a far more delicious flavor than any we get now.

General Isaac Bowman, Samuel Moffit, and some of our Plains neighbors, having secured a landing on the Nommock, at the foot of Monocacy Island, fitted up a fine seine and necessary boats (canoes) and caught half a dozen shad, having fished twice as many days. I shared two, having found the whisky (before my temperance days); others outbid me, determined to taste the good of their labor. I am in my ninetieth year.

13. *Statement of Isaac Thompson, Lee, Lee County, Ill., April* 12, 1881.

I was born at Pittston in 1796. My father's farm lay along the side of the Susquehanna River. I lived on the farm fifty-one years. In regard to the shad fishing, as I grew up to manhood I fished many days in the shad-fishing season of the different years. The first run was the male shad—not near as good as the female. After catching the first run then if we could have a rise of water then came the female—a far better quality. The female put for the headwaters of the river, and there would spawn; then the old fish would come back down the river, and the wind would often drive them on the shore, and they would lay there rotting till they stunk. People used to come down from toward Easton, Northampton County, and bring whisky and salt, and trade for fish; also from the upper part of old Luzerne County, bringing maple sugar to trade for shad. One man by the name of Taylor bought fifteen and put them in a sack after they were cleaned, shouldered them and walked off with them. I have known upwards of a thousand caught in one day on the point of the island. As to the localities of the fisheries, there was one at Falling Spring, about four miles from where I lived, another on the point of Wintermoot Island, and the next on the side of the island between two and three miles from where I lived. They

drew out on the beach of Samuel Cary's farm; another just below that, I think, drew out on the farm of Crandall Wilcox; another just below the falls. Please excuse me now, as I have done as well as my memory will allow me to. We have done no fishing since Nanticoke dam was built.

14. *Statement of Steuben Butler, a son of Col. Zebulon Butler, who led the patriots at the battle and massacre of Wyoming*, 1778.

I was born 1789; remember the old shad fisheries in the river here very well; was not a fisherman myself; after the run of shad had started I used to get in a boat and row up to the fishery and purchase my supply of shad and bring them down and salt them away. The price varied according to the abundance of the shad, some seasons being less expensive than others. As I recollect it, the Pettibones used to have charge of the fishery above Wilkes Barre.

15. *Statement of Dr. Charles F. Ingham.*

I remember the old shad fisheries in the North Branch, particularly the Butler fishery, which was on the bar opposite and a little above Union street, Wilkes Barre. Nanticoke dam was commenced in 1828 and finished in 1830, and I recollect that that ended our fishing. Although I saw shad caught below the dam by hooks attached to poles—think it was the year the Shamokin dam went out—yet I have never heard tell of or seen shad being caught since that time above the dam. The shad, as I remember them, were very fine and particularly large. I have seen the beach, after the drawing of the seine, for a hundred feet absolutely alive with flapping shad, each one reflecting the sunlight like a burnished mirror. I recollect having the salted and smoked shad during the fall and winter, and fine delicacies they were.

After our shad fishing was cut off a great number of salt shad were brought from Philadelphia and other points, meeting with ready sale, on account of general knowledge of their delicacy. I believe that at one time the people knew more of salt shad than they now know of salt mackerel, and more of smoked shad than now of smoked salmon.

I believe that a proper shad-way could now be put in the Nanticoke dam at an expense not to exceed $10,000, and probably for less, without interfering with navigation.

16. *Statement of Mr. Isaac S. Osterhout.*

In 1820 or 1821 we caught shad in very large quantities at Black Walnut Bottom. I remember well I went with a gentleman to Salina, N. Y., after salt, as we had run out of that article very early in the season; he had a load of whetstones and I a load of shad. I could have easily gotten rid of my shad on the first day had it not been that he and

I had agreed that the whetstones should sell the shad, and *vice versa*. So it was several days before we got our loads of salt, as the whetstones went terribly slow.

In 1822 and 1823 I was at Hunt's Ferry, where the shad were plenty. I came to Wilkes Barre in 1830, the early part of the year—the same year the Nanticoke dam was finished; do not recollect of any shad being caught after that. I recollect of a Mr. Water Greens, who came from New England and settled at Black Walnut Bottom, giving twenty barrels of shad for a good Durham cow.

17. *Statement of Miss Mary Coates.*

I was born in 1803; came to Wyoming Valley to live in the year 1823. I remember very well the catching of shad in large numbers by the inhabitants and the cleaning of them along the river shore. I remember, too, that the country people came in crowds during the season from miles away and returned home laden with fish. I remember the anger of Gildersleeve's negress one day, when it was said that Gildersleeve had made her wade out into the river after shad heads. The circumstance was as follows: While cleaning the shad she had cut off the heads and placed them on a board, saving this most delicate part of the fish for herself, and while she was busy the board, covered with shad heads, was either pushed by some one or drifted out into the river, when she waded out to get it. Do not know anything of the numbers caught. The people had shad from spring to spring. I do not remember of any shad being caught after the Nanticoke dam was put in.

18. *Statement of Capt. James P. Dennis.*

I remember the old shad fisheries in the river. There was one just below the bridge at Wilkes Barre, drawn out on the opposite shore; this was called the Bowman fishery. I recollect once holding the shore brail of the seine at this point, when William Alexander held the river brail. There was a fishery on Fish's Island, about three-quarters of a mile below the bridge.

19. *Statement of Jameson Harvey.*

I was born in 1796. I remember the old shad fishing in the North Branch of the Susquehanna River very well. James Stewart had a fishery opposite my place. The big haul was made at Fish Island fishery. I recollect it very well; they didn't know how many they caught. After all were disposed of that could be the rest were thrown on the fields, and pretty near stunk us to death; they were landed on the point of the island. There were two seines on Fish Island, one owned by Nanticoke parties the other by Buttonwood parties, who took turn about fishing. The Mud Fishery was at Steele's Ferry; they drew out on Shawnee side. The Dutch fishery was below the dam on Croup's place. Below Hunlock's Creek was another, that was called a Mud fishery. There was a fishery at Shickshinny. When the big haul was

made the shad sold for a cent a piece; they sold as many as they could: there wasn't salt enough. In those days they didn't salt down so much pork; they depended upon the shad they caught; they gave the poor a chance after they got all they wanted. People on the West Branch used to own an interest in the Hunlock fishery, and a Mr. McPherson used to come in a boat to get their fish and take them back. They used to come from Easton bringing salt, with which they used to buy fish; you could get one hundred shad for a bushel of salt. Nanticoke dam was commenced in 1828 and finished in 1830. I only recollect of one shad being caught above the dam since it was put in, and that was on the flats after a big freshet. The people used to go off the bars with as many shad as they could carry; they came in from all around in crowds; they used to camp, and salt their fish down on the banks of the river. Mr. McPherson used to take his boats back to the West Branch loaded. He traded off cider, oil, and whisky. At the time the dam was put in shad were selling for 10 cents and 12 cents each. Widow Stewart used often to take in $30 or $40 of a night for her share of the haul.

Hunlock's, Dutch, and Mud fisheries were night fisheries. Stewart's and Fish Island were day and night fisheries. Farmers hauling grain to Easton often hauled back hundreds of bushels of salt. Boats coming up the river used to bring leather, cider, oil, salt, and iron; going back they would take shad.

McPherson and Hunlock owned the Hunlock fishery and had a large fish-house. Hunlock got as his share from five to six hundred dollars per year, besides all the shad he could use. We used to have shad until shad came again.

The owners of fish-houses used to have arrangements so that when they ran out of salt they could dry and smoke the shad, as they now do herring and salmon. Some of the shad used to weigh 8 or 9 pounds. I saw one weighed, on a wager, turning the scales at 13 pounds; about seventy or eighty would fill a barrel. The shad improved very much coming up the river, those caught in this valley being very much larger and finer than those caught at Columbia. I remember when Shamokin dam went out the shad came up to our dam and were caught.

20. *Extract from Miner's History, p.* 209.

April 21, 1778.—At a town meeting prices were set on articles of sale, &c.:

Winter fed beef, per lb	7*d*
Shad, apiece	6*d*
Tobacco, per lb	9*d*
Eggs, per doz	8*d*

21. *Extract from the Susquehanna Democrat.*

1818, *April* 17.—"Newark, N. J., April 7th, shad fishing. On Wednesday 3 shad were caught in the river Passaick. A pair of them weighed eleven pounds, and were sold to one of our public innholders

at a shilling a pound. A solitary one was caught about 2 weeks before and sold to the same innkeeper."

1819, *May* 14.—"Shad are this season taken in unusual numbers; they have been sold in Philadelphia as low as $4.50 per hundred and at the Potomac fisheries as low as $3."

1820, *April* 21.—"At Alexandria shad *is* selling for $2.50 a hundred and Philadelphia they are selling for $3. In Wilkes Barré, notwithstanding the scarcity of money, they are held at $18.75."

1822, *April* 26.—"We congratulate our friends on the prospect of soon obtaining a supply of fresh shad; about sixty were caught here on Wednesday (24th), and yesterday (25th) upwards of three hundred. We learn that at Berwick they are caught in abundance."

The above was all that could be found in a file of fourteen years, 1810–1824, bearing upon shad. In the Federalist, printed at the same time, nothing was found.

22.–*Deed by Silas Smith of half his shad fishery.*

Know all men by these presents that I, Silas Smith, of the township of Newport, county of Luzerne, and State of Pennsylvania, have sold unto Caleb Wright of the district of Huntington, in the county and State aforesaid, one equal half share of a fishery on the lower end of my farm, for the consideration of twenty pounds ($53.33) lawful money of Pennsylvania to me in hand paid, the receipt of which I hereby own and acknowledge. I hereby bind myself, my heirs, executors, administrators, or assigns, and every of them, by these presents, to warrant and forever defend unto him, the said Caleb Wright, his heirs, executors, administrators, or assigns, the one-half of said fishery to the only proper use and benefit of him, the said Caleb Wright, his heirs, executors, administrators, or assigns.

In witness whereof I have hereunto put my hand and seal, this fourteenth day of May, in the year of our Lord one thousand eight hundred and four—1804.

23.–*Extract from Miner's History of Wyoming, p.* 141.

"The month of February, 1773, had so nearly exhausted the provisions of the Wilkes Barre settlement that five persons were selected to go to the Delaware, near Stroudsburg, for supplies. * * * The distance was fifty miles, through the wilderness, &c. * * * The men took each an hundred pounds of flour, and welcome was their return to their half-famished friends at Wilkes Barre. Never was an opening spring or the coming of the shad looked for with more anxiety or hailed with more cordial delight. The fishing season of course dissipated all fears, and the dim eye was soon exchanged for the glance of joy and the sparkle of pleasure, and the dry, sunken cheek of want assumed the plump appearance of health and plenty."

VIII.—THE FISH SUPPLY OF LONDON.

[From the London Quarterly Review.*]

1. *Report of Spencer Walpole, esq., Inspector of Fisheries to the Home Office, on the destruction of fish at Billingsgate, in consequence of the alleged inadequate accommodations at Billingsgate Market.* (*Ordered by House of Commons to be printed July* 20, 1881.)
2. *Report to the Common Council from the Fish Supply Committee appointed by the Corporation of the City of London.* (*October* 31, 1881.)
3. *Minutes of evidence taken before Special Committees of the Lords and Commons upon the London Riverside Fish Market Bill.* (*Session of* 1882.)

Nearly thirty years have passed since the publication in our pages of an article which produced no ordinary impression at the time of its appearance. In that article, having for its subject "The commissariat of London," we ask our readers to imagine that the principal meal of the day was proceeding in a well-to-do metropolitan home, and we endeavored to trace to their sources the various edibles consecutively put upon the table—the fish to its ocean-bed; the flocks and herds to their downs and pastures; the wild animal to its lair; the game to its covert; the fruit to its orchard; the bread to its parent cornfield—in order to point out how they are fattened, netted, trapped, captured, bagged, gathered, harvested, and conveyed to their ultimate destination, "the great red lane of London humanity."

It was natural under these circumstances that we should begin with fish. Although we devoted no more than nine pages to chronicling the operations then carried on in "Mr. Bunning's new market at Billingsgate," it could hardly have escaped the notice of an intelligent reader that "the harvest of the sea," being, as Mr. Spencer Walpole and Professor Huxley assure us, "practically inexhaustible," could not be thoroughly described, or, indeed, be more than glanced at within so brief a compass. We told our readers what fish are ordinarily brought to Billingsgate at that time; but of the fish which, were it not for the limited area and inaccessibility of London's only market, might be brought there, we said nothing. The total supply of fish sent annually to Billingsgate about the year 1853, as given in Mr. Horace Mayhew's "London Labor and the London Poor," seemed to us so enormous, that we submitted the table to an undeniable authority, who assured us that it was no over-statement. What would he now have said if

* No. CCCVIII, October, 1882. pp. 231 to 242.

told that the volume of fish sent to Billingsgate was nearly three times larger in 1880 than in 1853; that within the last six years it has increased from 95,000 to 130,000 tons per annum, and that this latter figure means a supply of 400 tons of fish for every working day, being, according to Mr. Edward Birkbeck, M. P.,, equivalent to a drove of 1,000 fat oxen entering London upon every one of 313 days in each current year?

Surprising as this statement may appear to many, it is nevertheless beyond a peradventure that of the cheaper and coarser kinds of fish which would enter directly into the consumption of the poorer classes an absolutely illimitable supply might be poured into the metropolis by river if a suitable market, open at all hours and accessible at all states of the tide, were available to receive it. Before showing what sort of fish market it is absolutely necessary that London should have, we propose to reveal what, at this moment, Billingsgate is. The materials for describing it lie close at hand. They may be gathered in abundance from Mr. Spencer Walpole's report to the home office; from that of the fish committee appointed by the corporation of the city of London, to which Billingsgate belongs; and, *passim*, from the evidence given before the two special committees of the Lords and Commons, which sat last session, to consider the "London Riverside fish market bill." Better, however, than any description would be the practical experience gained by a Londoner who had sufficient energy and curiosity to pay Billingsgate a visit between the hours of 5 and 9 upon a Friday morning, the best day in the week for seeing it to advantage. There is an Eastern saying, to the effect that the distance between the ear and the eye is very small, but the difference between hearing and seeing very great. Reading is but another form of hearing and to those who care to understand what the Billingsgate monopoly means, we would recommend a visit to the famous market upon the first morning of a week-day that may suit their convenience.

Billingsgate market (concerning the antiquity of which there is a difference of opinion between those who hold, with Mr. Walter Thornbury, that it owes its origin to Belin, a king of the native Britons, who flourished 400 years B. C., and others who maintain, with Stow, that a man called Billing, or Beling, owned a wharf upon the same spot, presumably in Queen Elizabeth's reign) is now and has been the property of the city of London for so long a time that it is not easy to calculate the amount of revenue already brought in by it. It has a frontage to the river of 200 feet, and a superficial area of 40,000 square feet, which area affords sites to seventeen shops and two large public houses, although, since the "Riverside fish market bill" came before Parliament, the site of one of these public houses has been voluntarily thrown into the market.

The interior of this metropolitan emporium of fish, being obviously far too narrow for the business transacted there, is divided into spaces or forms placed in such close contiguity to each other that the customers

purchasing at one form interfere with those who would fain approach its neighbor. The price charged for the forms is excessively high, being at the rate of 9*d.* a square foot per week for each. Billingsgate is situated above that portion of the river call the Upper Pool, which carries more floating traffic than any other reach of water approaching it in size upon the face of the globe, so that the dangers of navigation to which cutters and steamers approaching the market by night are exposed exceed description. The width of the portion of the river opposite to Billingsgate left open for navigation does not exceed 200 feet. In front of the market, on the water side, there is a large floating pontoon, but the steamers are not allowed to come alongside it in order to unload, being compelled to lie off at a distance of nearly 100 feet from the market quay, and to land their fish along planks thrown out from the steamer to a barge, and from this barge to the floating pontoon. Every pound of fish brought by steamer and landed from the river at Billingsgate is carried along these planks upon men's heads. Only two roads, one from and one to the steamers, are permitted to exist, and as the men have no choice but to follow each other it is evidently impossible to land a large quantity of fish before the market closes at nine in the morning. The result is that fresh fish is often thrown away, because it will not keep until 5 o'clock upon the following morning. This being the plight to which fish-carrying steamers are reduced, the trials and difficulties awaiting sailing cutters entitle them to still greater commiseration. Being sharp-bottomed vessels they have to lie out in the stream, and to land their fish, at considerable expense, in barges. There were once some piles in the river to which the cutters could make fast, but the market authorities drew them. It ought, in addition, to be mentioned that the work of landing fish along the planks which we have just described is dangerous to the men engaged in it, and all the more so because during half the year it is done in the dark. Accidents happen frequently, and occasionally there is a loss of life. The unnecessary expense entailed in this manner upon those who consign fish to Billingsgate may be inferred from the fact which came out in evidence that the largest firm in the trade had in 1880 to pay £4,321 9*s.* 4*d.*, and in 1881, £4,854, 8*s.* 7*d.* for landing their cargoes, an outlay which, had it been possible for their steamers to moor at the market quay, would have been entirely avoided, and which, of course, came ultimately out of the pockets of the consumers.

The approach to Billingsgate market from the land side is along Lower Thames street, a thoroughfare which is from twenty-eight to thirty feet wide, and along which not more than two vans can pass abreast. It follows, therefore, that only two streams of traffic can flow along it at the same time, and thus, if a van is being unpacked at the market, one of the two streams is temporarily blocked. If an accident of the most trivial kind should occur the whole of the traffic is brought to a stand still. Six vans, and no more than six, can unload side by side at

the same time. The market opens at 5 o'clock a. m., before which hour no fish is allowed to be sold. As there are no vacant spaces or "lay-byes," for carts, for costermonger's barrows, and for vans, the streets adjoining the market are completely blocked as the hour of 5 a. m. approaches. The scene is of a nature to fill the spectator who witnesses it for the first time with wonder that, in the largest and most civilized capital upon the face of the globe, such a disgraceful anachronism should have been tolerated for so a long a time. Every lane and street leading to Lower Thames street is choked with costermonger's barrows and with fishmonger's carts, which extend as far as Cannon Street Arch, King William street, Monument Yard, East-cheap, and Tower Hill. The market, as we have already laid, closes at 9 a. m. When the clock strikes nine the police interfere and clear all the closely-packed vehicles, sometimes amounting to nearly four thousand in number, out of the city, in order to make way for the ordinary day traffic of the streets.

The market being open for four hours only, it follows, as a matter of course, that there are many customers who cannot complete their purchases before their barrows and vehicles are driven away. The nearest points to which they can retire are Tower Hill, Tooley street, or some other convenient spot outside the city bounds, where they wait until the fish is brought to them upon the heads of porters who charge heavy fees, and waste, into the bargin, no small amount of precious time.

So far as costermongers and fishmongers are concerned, the Billingsgate trade ceases at 9 a. m. After that hour the reign of the middleman or "bummaree" commences. It is of little moment to inquire how old this word may be, or whether, as suggested by Mr. Walter Thornbury, it is of Dutch origin, but at least it is certain that bummarees were known to Robert Burns's friend, the antiquarian and wag, Captain Grose. We find in Jonathan Bee's Lexicon Balatronicum, or Slang Dictionary, published in 1823, that "bummaree" is defined as "the man who at Billingsgate takes the place of the salesman, and generally after 8 o'clock a. m. buys the last lot. Derived partly from mare, the sea, to which most of them have been addicted." Writing in 1853, Mr. Mayhes says: "The market opens at 4 a. m., but for the first two hours it is attended solely by the regular fishmongers and by bummarees. As soon as these are gone the costers' sale begins. Many of the costers who deal usually in vegetables buy a little fish, especially if it is cheap, on the Friday, which is the fast day of the Irish; not to mention that the wives of mechanics run short of money at the end of the week and are compelled to eke out their dinners with fish." Since Mr. Mayhew wrote these words there has been a slight change in the conduct of the market. At present the bummaree is the first to reach and the last to leave the market. He is still of great use, but not so necessary as in 1853. At that time fish were sold in large lots, which the bummaree, as a member of the Billingsgate ring, bought, and,

having broken them up into smaller lots, sold to little buyers. Now, however, the large factors sell by auction, offering only one package or box containing at most 1 cwt. of fish at a time. This lot fetches from 1*s.* up to £7., according to the description and quality of fish contained in it. Thus the fishmonger and coster have a fair chance of bidding against what is called "the trade," but it is the bummaree's province to sort and divide the contents of each box into fish of different sizes for the convenience of the retailer. After 9 a. m. the auctioneers are obliged to sell or throw away the fish still left on hand, and the bummarees, acting in concert, have it in their power to fix the price at which it is knocked down. The result is that many lots are "for a song," and that occasionally large quantities are thrown away, which, if retail fishmongers and costermongers could make their way to the market at any hour of the day, would infallibly be sold at fair prices, instead of being sacrified or wasted as is now the case.

In his interesting evidence before the Lords committee, Mr. Spencer Walpole defined the position and occupation of the bummaree as follows:

"The ordinary course of business is for the wholesale salesman to sell fish to the retailer; but in Billingsgate the bummaree steps in between the two men. He buys the fish after market hours from the wholesale salesman, and takes the chance of selling it in the course of the day at a profit to the retailers. Therefore, as I understand the matter, he occupies very much the same position as the man who used to be called the 'forestaller' or 'regrater' in the corn market at the beginning of the century."

Far be it from us to rail against the bummaree. As the matter now stands he fulfills very useful functions, but it cannot be denied that his very existence is due to the deficiency and inadequacy of the market in which he conducts his operations. When a new wholesale and retail emporium has been established upon the river side we trust that the bummaree may emulate the example of that sagacious guard to the Edinburgh mail who got himself converted into a stroker, and thus found a new vocation to engage his attention. At present the bummaree stands between the costermongers, who represent the poor of London, and the fish for which they are clamoring. Billingsgate has bred and nurtured him, and with the Billingsgate monopoly it is to be hoped that he too will be improved off the face of the earth.

Two efforts, according to Mr. Walpole, have been made to divert the fish-trade of the metropolis from Billingsgate. In the first place a market was established at Hungerford Stairs. Being too far up the river and too remote from the East end it had but a brief span of existence. When we mention that a line drawn north and south across the center of London Bridge leaves a population of about one million six hundred thousand souls who live below the bridge, and about two million four hundred thousand souls who live above it, it will be seen

at a glance that Hungerford Stairs are not easily accessible to costermongers engaged in supplying the dense masses of poor people who dwell at the the East end. The second attempt to supplement Billingsgate was due to the generosity of Lady Burdett Coutts, who caused a superb building to be constructed in East London, and gave it the name of Columbia Fish Market. It had a still shorter lease of life than its predecessor at Hungerford, the consequence being that the ancient tyrant flourished with greater vigor than ever. As time advanced the inconveniences of Billingsgate, always considerable, were enhanced by the increasing magnitude of the trade and by the altered conditions under which it was conducted. The railway soon began to supersede the river, and fish, instead of coming to London by water, found its road there in fast trains. It was bad enough for smacks, cutters, and steamers to thread their tortuous way to the metropolitan fish market along a river which is always choked with traffic, and through the mazes and intricacies of the "Upper Pool;" yet, while the market could be reached somehow or other by water, it had become almost unapproachable by land, and it was by land that two-thirds of the fish supply of London now came to Billingsgate.

The following table of the quantity of fish delivered at Billingsgate market, or its immediate vicinity, between the years 1875 and 1880 will show the proportions of railway-borne to water-borne fish, and we shall have something to say presently as to the comparative cost of the two modes of carriage:

	1875.	1876.	1877.	1878.	1879.	1880.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Delivered by railway	71,367	73,919	82,771	94,566	92,474	87,884
Landed at wharves	1,473	1,259	1,698	4,903	4,338	5,487
Water-carriage fish landed at the market	22,109	24,247	22,799	27,300	30,080	37,258
Total	94,949	99,425	107,168	126,769	126,892	130,629

How bad the land approaches to Billingsgate have always been we have already shown, but their badness was of comparatively slight importance so long as the bulk of the fish was brought thither by water. When, however, it became necessary to deal each year with some 90,000 tons of railway-borne fish, and to deliver them at Billingsgate through choked streets and narrow lanes which would disgrace a town of 50,000 inhabitants, the difficulties were so augmented that fish vans sometimes took eight hours to get from the Great Eastern or Great Northern Railway terminus to the market where they had to unload. Each succeeding year the block increased; and, moreover, it was still further aggravated by the development of the trade in dried and fresh fruits. The fruit salesmen, says Mr. Walpole, like the fish salesmen, naturally congregated at the river side. The fruit arriving in the docks were landed and carried through Thames street to Pudding Lane, where most of the

fruit salesmen took premises; and the unfortunate street, which was altogether too small for the fish trade alone, was required to accommodate the fruit trade also.

It must not be supposed that the city fathers were blind to the growing inconveniences of their solitary fish market. Without going back further than twenty years we may notice that in 1862 Mr. Horace Jones, the city architect, suggested the only practicable scheme for making Billingsgate more accessible by land that has yet been laid before the common council. At an estimated cost of £88,000 he proposed to construct a new street from the corner of East-cheap and Fish Street Hill to Thames street. The common council approved, but allowed the proposition to lie on the table; and when, twelve years later, the improvement committee of the city of London sought to give effect to the city architect's plan it was found that in the interval between 1862 and 1874 the estimated cost had risen from £88,000 to £525,000.

Time went on, and matters at Billingsgate proceeded from bad to worse. At length, in 1878, Colonel Fraser, the chief commissioner of city police, reported to court of common council that, in the phrase so much dreaded by Lord Melbourne, "something must be done." Colonel Fraser protested emphatically that "the commerce had far outgrown the capacity of the streets for carrying it;" adding that "an overgrown business is carried on in thoroughfares or rather in lanes not wide enough to admit more than two lines of traffic," the consequence being "that the stoppage of one vehicle for any purpose brings the rest to a standstill." The only effect produced by his energetic remonstrance was that Monument Yard was paved as a street, so that many of the fruit vans and some of the fish vans were able to find standing room there.

Nothing else of a material nature was done or attempted with a view to improving the approaches until, in 1881, the corporation of the city of London resorted, not for the first time, to the evasive measure which is invariably adopted by the House of Commons when in perplexity. They appointed a committee to inquire into the fish-supply question, and about six months later the home secretary instructed Mr. Spencer Walpole to report upon the handling and distribution of fish at Billingsgate. Both reports are now before us, and between them there is substantially no difference, although Mr. Walpole's is the abler and more searching of the two. Both agree in stating that Billingsgate is far too small and too difficult of approach by land to fulfill the duties imposed upon it as the sole wholesale and retail market for supplying fish to a population of from five to six millions, resident within 7 miles of the Royal Exchange—that is to say, upon an area which embraces about 150 square miles of ground.

A few brief extracts from each of these important documents will be of service in elucidating the bearings of the question. From the report of the corporation's fish supply committee let us select the following passage:

"We now come to the question which directly affects the corporation

as the market authority, viz, the sufficiency or otherwise of the present accommodation of Billingsgate market, and of the approaches thereto, to meet the requirements of the present day; and when, as regards the approaches, we plainly record our opinion of their absolute insufficiency, we make no new admission, but simply indorse the oft arrived at conclusion of this court. The prior question, however, as to the market accommodation is on a different footing. On three separate occasions, within little more than a generation, the market has been enlarged or entirely reconstructed, and therefore in this direction the corporation has given practical proof of its desire to keep pace with the requirements of the metropolitan fish supply; and yet, incredible as it may appear, not only the weight of evidence in this inquiry but the prior action of the court and a pending reference to the markets committee alike go to prove that even now additional market accommodation is absolutely necessary."

So far from it "appearing incredible" to us that additional market accommodation should be necessary, it would indeed be strange if a bit of land about twice the size of the site upon which Exeter Hall stands sufficed for the purposes to which it is now put, even if the land approaches to it were as ample and unobstructed as those which lead to Albert Hall or Kensington Gardens.

Reverting, however, to the report, we desire to call special attention to the following words:

"We now approach, not without diffidence, the crucial point of our duty, viz, the course of action which we deem it wise and right to recommend to the court. The whole of the information gathered together has received our closest attention, and we have the satisfaction of reporting that we have unanimously, though, as regards some members, not without altering a previous impression, arrived at the conclusion that one wholesale market is calculated to meet the requirements of the trade and the interests of the public. We are also of opinion that such market should be at the waterside; and, as a general principle we are further of opinion that there should be ample and sufficient approaches from all parts of the metropolis to the site of any wholesale fish market. We beg further to state that, although in our judgment the fish market ought to be at the waterside, yet, should the court be of opinion that an inland market for the reception and sale of railway-borne fish is also required, we in that event suggest either of the two sites, one in Farringdon road, to the north of Charterhouse street, and the other the site of the present Farringdon market, as appropriate for the purpose. Of the market itself, we are of the opinion that it should be one based upon the same system as that at present in existence in Paris, viz, a wholesale, a semi-wholesale, and a retail market, all under one roof. We recommend that no restriction whatever should be made as to hours of business, but that the market should be free and open at all reasonable hours calculated to facilitate the reception, sale, and dis-

tribution of fish. Finally, we are of opinion that, taken in connection with our earlier remarks as to destruction of spawn, and the taking of immature fish, and also the present rates charged for railway carriage, the following have, amongst other causes, contributed to the unsatisfactory state of the fish supply, viz:

"1. The small size of the market at Billingsgate.

"2. The utterly inadequate approaches thereto.

"3. The arrangement at present existing for its management.

"We have spoken frankly, and we fully realize that our recommendations involve important and costly changes, which, however, are called for by the present condition of things."

Before proceeding to show how utterly incompatible the recommendations of the corporation's fish committee are with the further existence of the Billingsgate monoply, it seems desirable to repudiate without further delay any agreement with the allegations of this report as to "the destruction of spawn and small fish, and the taking of immature fish." With this end in view we cannot do better than quote the words spoken at a meeting of the Society of Arts, upon the 10th of May last, by Professor Huxley, who is perhaps the highest authority in England upon such matters. In reply to a not very wise speech, complaining that the fish supply of London was falling off and the retail price of the article increasing, and attributing the mischief to the wholesale system of trawling now in vogue, "which destroys millions of small fish, and ruins no end of spawn," Professor Huxley rose and said that—

"He experienced much the same sensation as Rip Van Winkle must have felt when he awoke after his long sleep; for the speech he just heard was identical in spirit and almost in words with a great multitude of speeches which came before him about twenty years ago, when he had the honor of being a royal commissioner to inquire into the condition of our sea fisheries. That commission arose in this way: Mr. Milner Gibson, who was president of the board of trade, sent for him one day, and told him that a member for a northern county meant to move for a commission of inquiry into the destruction of the fisheries on the east coast by trawling, and asked him what he thought about it. He ventured to say that he thought it was all nonsense, and that Mr. Milner Gibson had better refuse the commission. He did so, but the member beat him in the House of Commons, and he sent for him (Mr. Huxley) next day and told him he must serve on the commission. He served on it for two years, during which time a larger body of evidence came before him than had come under the eyes of most people. The complaints then made of trawlers were precisely those they had just heard; that the damage done by line fishermen was destroying a great source of the supply of men to the navy; that it was destroying the breeding of fish in the North Sea, more especially cod, whiting, and haddock; and, not only so, but it was rapidly destroying that upon which the trawlers

themselves subsisted. It came out in evidence, first and foremost, that the fishing population supplied no appreciable contingent to Her Majesty's navy. It came out, in the second place, that the charge made against trawlers, that they would destroy the spawn of the fish ordinarily caught by the long lines, had no foundation; for, although it might appear strange for him to say so, yet he believed there was no body of men more absolutely ignorant of everything relating to fish, except the catching of them, than fishermen. The first complaint which came before them was that trawlers were bringing up an enormous quantity of spawn every day in their trawls; but, upon inquiry it turned out that what was supposed to be spawn was nothing but gelatinous inhabitants of the sea, which had just about as much to do with fish as cocks and hens to do with Jumbo. With regard to the charge made against trawlers of destroying spawn, he might mention that such fish as haddock and cod did not lay eggs at the bottom of the sea; their eggs floated at the top, so that it was impossible for the trawlers to destroy the spawn. Since that time there was abundant evidence to prove that, while trawlers had gone on steadily increasing, there had been no diminution in the number of cod, haddock, and whiting caught. Lastly, as to the supposed injury that the trawlers were doing themselves, there was no question that up to the present moment the amount of capital invested in trawling vessels had steadily increased, and he could not understand shrewd and clear-headed people like the last speaker putting their money into a business if it did not pay expenses. He could not describe the audacity of the statements made at that time with respect to trawl fishing. Witnesses came before the commission and stated that trawled fish were unfit for human food; that they were poisonous; and one man summed up all the demerits and atrocities of trawl fish by saying that they were "mashiated," though what he meant by the remark it is impossible to say. Beyond all doubt, if anything were done to stop trawl fishing on the enormous scale on which it was now carried out in this country; it would no longer be a case of complaining of the price of fish, but ninety-one out of one hundred would not be able to buy any fish except herrings and the like, which were caught in the open sea by nets. He could not give the figures now, but he recollected it being stated some time ago that 800 trawlers hailed from the port of London, and therefore it was preposterous to talk of interfering with their fishery. No answers had been put forward to the arguments adduced in the report to which he had referred, namely, the constant increase of capital put into the trawling business and the constant increase in the tonnage of the vessels employed; and to such patent facts as these, that a town like Brixham was absolutely built out of trawled fish, and the trawlers who caught the fish had trawled over a comparatively small area close to Brixham for the last 70 or 80 years, but the fishing was going on now as well as ever."

In these words Professor Huxley was but echoing the opinions of his

former colleague, Mr. Spencer Walpole, whose views we shall presently have occasion to quote. Before doing so, however, we invite our readers to observe that the recommendations of the corporation's committee require Billingsgate, as the sole fish market of the metropolis, to possess properties which are absolutely impossible and unattainable under the circumstances. In the first place, its land approaches could never be made sufficient without spending a sum of money which would stagger even the city fathers, and throw their yearly budget into inextricable confusion. Secondly, the approach by river through the Upper Pool will always present insurmountable difficulties. Thirdly, the area of the market is far too small, and cannot be increased unless the custom-house be given up to the city, which the Government has no thought of doing. So hopeless, indeed, did the retention of Billingsgate as the sole metropolitan fish market appear to be in the eyes of the civic committee that they were induced to turn their attention to other river-side sites, and specially to one near Blackfriars Bridge, the estimated outlay upon which would have entailed an expenditure of from £900,000 to £1,200,000, not to mention that the conservators of the river would be certain to forbid its selection, on the ground of the encroachment it would make on the water-way. Lastly, the committee avow their opinion that neither the enlargement of the area of Billingsgate nor the establishment of additional markets at Farringdon road or elsewhere "would supersede the necessity for providing better approaches for facilitating the traffic in that locality." A more damaging denunciation of Billingsgate than is supplied by the report of the corporation's own committee it would indeed be utterly impossible to conceive.

Mr. Walpole is equally explicit to the same effect. His report says:

"Fishing in the North Sea, the great source of the London fish supply, is carried on in two ways: (1.) By boats working in fleets on the Dogger Bank, on the Silver Pits, on the German coast, and on other favorable fishing grounds; and (2), by boats working grounds usually nearer home, either singly or with only one or two companions. When the boats work singly and near home they are rarely away for more than twenty-four or forty-eight hours; when they work in fleets they are away for weeks and even months at a time. In the former case the boats returning to port to unload the fish sell them on the fish quay; the fish are then packed by the buyers and sent to London by train. They are more or less exposed to the sun on the boat, and they are exposed on the fish quay; they are then packed, in ice it is true, in a truck which has perhaps been standing in the sun for some hours; they are brought up in a railway van to town and then carried in a van through the streets of London. But when the fish are caught by boats working in fleets fast steamers attend the fleet to carry the fish back to London. They are removed almost as soon as they are caught to the hold of the steamer, covered with ice, and never unpacked till the steamer reaches Billingsgate.

"It does not require much reflection to conclude that fish dealt with in this way are more likely to reach London in good order than those which are removed from the boat to the quay, from the quay to the railway van, from the railway van to the street, and from the street to the market. In fact I believe I am right in saying that no fish coming by water would be condemned if it were not for two reasons: (1.) It occasionally happens that the fleet has moved its position before the steamers arrive, and the steamers in consequence fail to find it. (2.) It also occasionally happens that the catch is so large that the steamers are unable to store the whole of it in their holds, and are forced to carry some portion of it on deck.

"It is obvious then that, except from accidental circumstances, there is and there need be no loss among the fish which reach London by water. Water-carriage is cheaper than land-carriage. A box of fish carried direct by water to Billingsgate costs 2*s*. 1*d*. for carriage. The same box carried by land costs 3*s*. 9½*d*., viz, 1*s*. 7*d*., its carriage to Grimsby, and 2*s*. 2½*d*., its carriage to London. It is not surprising, therefore, that as the cost by water is less and as the fish arrive in better condition, the London salesmen should prefer water-borne fish, and should look for the solution of every difficulty by a further development of the water traffic."

Mr. Walpole proceeds to give his reasons for thinking that, despite its superior cheapness, water-carriage will never entirely supersede the land-carriage of fish. He states that with a view to discouraging the land-carriage of fish some of the merchants who came before him as witnesses went so far as to propose that single-boat fishing should be prohibited by Government, and the men forced to fish in fleets. This suggestion seemed, in Mr. Walpole's eyes, to be impracticable. Fishermen are influenced by the same motives as other men. They naturally object to a system of fishing which keeps them away from their families for weeks at a time, and prefer to it a system which enables them to return home once in every twenty-four hours, even though the result may be that their fish cost a little more for carriage to London and arrive there in rather worse order. Is it possible, asks Mr. Walpole, to provide that railway-borne fish shall reach London so that a very small proportion shall be in a condition to necessitate condemnation? The witnesses who appeared before him at Billingsgate were of opinion that if inspectors were appointed at the various ports to prevent the sending forward of fish which were already bad this highly desirable consummation might be attained. But where are these inspectors to reside? If at the principal ports the fishermen would certainly resort to other ports where there are no inspectors. If, however, inspectors were established at every port and village where boats can land the expense would be out of all proportion to the end aimed at. Nor could it be expected that the Government would consent to bear the charge of a duty which would primarily be of advantage to the metropolis alone. It would be

still more hopeless to ask local authorities to incur expense for a purpose diametrically opposed to the trade of their neighborhood. The only possible course seems to be to condemn in London the fish which are bad when they reach Billingsgate, and to trust to the effects of this condemnation to prevent salesmen from wasting money by sending other bad fish to London.

"If this conclusion be correct," adds Mr. Walpole, "then the state, not of Billingsgate, but of the approaches to Billingsgate, must, in my judgment, be held responsible for some portion of the loss which arises from the necessary destruction of condensed fish. I have already endeavored to describe what those approaches are. The vans arriving from the railway station, the carts of the retail dealers arriving to buy, make them almost impassable, and the system on which the traffic is, perhaps unavoidably, conducted, makes confusion almost hopeless. On general grounds it would apparently be desirable that the vans which reach the market first should be unpacked first, and should then proceed as empties to their destination. But in practice this is never uniformly done. The vans which arrive first may contain fish for which there is no particular demand, while the vans which are perhaps in the rear of the line may contain other fish for which there is a great demand. The vans, therefore, instead of being unpacked, are forced to move on, and thread their way through the crowded thoroughfares of London till they are able to obtain a fresh place in the line. One van, whose case was exceptionally unfortunate, returned in this way, not merely time after time, but day after day, and for eleven days. The fish which it contained were of course ultimately condemned.

"How, then, is the difficulty to be obviated which at present exists? I believe it to be impossible to obviate it till the approaches to Billingsgate are reconstructed, or the market is itself removed. A market does not deserve the name which does not afford (1) accommodation for buyers and sellers; (2) standing room, and, where perishable articles are concerned, standing room under covered ways, for the vans which are being unpacked; and (3) easy access. Billingsgate fulfills the first of these conditions. It wholly fails to fulfill the second and third of them. A market without approaches is, in fact, as inconvenient as a house of many stories with-out a staircase. It is said that the amateur architect is apt to forget the staircase when he builds the house. I should very much regret to call the corporation of London an amateur architect, but it has undoubtedly committed the mistake of reconstructing the market and of forgetting the approaches."

We have said enough to show that Billingsgate is past praying for; nor can much sympathy be expected from the public with the efforts made last session by a portion of the common council to save its life by defeating the London riverside fishmarket bill before the special committee of the House of Lords. Thanks to the refusal of Lord Salisbury and of the Duke of Richmond to sustain the two mischievous

clauses imported into the bill by the Lords' committee, and thanks also to the energetic speech of Lord Shaftesbury, these clauses were withdrawn, and there is at length a fair chance that London will shortly have a riverside fish market worthy of the largest and hungriest city in the world."

It remains for us to inquire what are the attributes and properties that a metropolitan fish emporium should possess, and to see how far they are supplied by the site at Shadwell, where it is understood that the new market authorized by the two Houses of Parliament is about to be established. What these essentials are was clearly laid down by the fish committee of the common council when they arrived at the following conclusions:

1. That one wholesale market is calculated to meet the requirements of the trade and the interests of the public.

2. That such a market should be at the water-side.

3. That there should be ample and sufficient approaches from all parts of the metropolis to the site of any wholesale fish market.

To these three very obvious conclusions a fourth might have been added to the effect that the market should be established at a point where the river is sufficiently wide for the sailing vessels and steamers moored at the market quay to be out of the way of the stream of floating traffic which passes ceaselessly to and fro along that crowded highway of nations.

That the site at Shadwell conforms to these conditions is evident from the following arguments which were deemed irrefutable by the special committees of the Lords and Commons when brought before them last session.

1. The London riverside fish-market bill authorizes its promoters to take about eight acres of land in the parish of St. Paul, Shadwell, four acres of which they bind themselves to appropriate for the new fish market and its approaches.

2. The site, like that of Billingsgate, is on the north side of the river, to which it has a frontage of 600 as against that possessed by the Billingsgate of 200 feet. It lies nearly two miles below London Bridge, at a point where the Thames is 1,100 feet wide, and being situated on the edge of a bay, out of the influence of the tide, and 500 feet clear of the ordinary traffic of the stream, it enables vessels approaching it to avoid the difficult and dangerous navigation of the Upper Pool, which is no ordinary advantage when we remember that the fish craft for the most part arrive in the dark.

3. The shore can be leveled so as to admit vessels of thirteen feet draught alongside the wharf at half tide. Vessels will lie next the wharf, and unload direct into the market, thus avoiding the expense, delay, and danger of the present system of discharging. There is a boat ferry at either end of the site, and a steam ferry is about to be reopened at a short distance to the west. This steam ferry can make from seven to

ten trips in an hour, and can take from seventy to ninety costermongers barrows at a time.

4. As regards the access to the market by land the streets and roads leading to the selected site at Shadwell are wide, unencumbered by ordinary traffic, and of easy gradients. Out of the eight acres acquired the market proper will occupy 75,000 square feet, or one acre and three-quarters, and the rest of the property will be laid out in ample approaches and in "lay byes" for carts and barrows, and also in the erection of the necessary shops, warehouses, and buildings connected with the market.

5. On the three land sides of the market there will be a broad street, so that four-and-twenty vans can lie side by side and unload simultaneously. Not a single fishmonger's cart or costermonger's barrow will be more than 150 yards away from the center of the market, so that the porterage will be reduced to a minimum and no time will be wasted. The market will be open all day, and accessible from a very early hour in the morning until late at night to ships approaching it by water and to costermongers approaching it by land. The maximum tolls fixed by the bill are very much lower than those charged at Billingsgate.

It will thus be seen that the Shadwell site fulfills all the conditions required by the reports of the corporation committee and of Mr. Walpole, who, having examined the spot, gave evidence in its favor before the House of Commons' committee. It should also be mentioned that no steps were taken by the promoters of this bill to get permission from parliament to make a new fish market at Shadwell until the corporation of London and the metropolitan board of works had been repeatedly urged, but in vain, to take the matter up. The want of additional market accomodations being admitted on all hands, what, it may be asked, is the corporation of London doing to supply it? With the exception of attempting to convert the fruit market at Farringdon into a fish market nothing has been or will be done; and it is admitted on all hands that an inland market of this kind will do little towards cheapening and making more abundant the coarser kinds of fish, which do not come to London by costly railway carriage but can only be brought by river.

These details can hardly be deemed uninteresting when we remember the stake at issue and the degree to which they affect it. There is and has long been a popular impression that many of our sea-fisheries are less fecund than of yore, and that the ocean is growing more and more to deserve the epithet of "barren," which Homer was so fond of applying to it. How far this is from being the case let the following passage from Mr. Walpole's speech, delivered before the Society of Arts upon the 10th of last May, suffice to attest:

"You are all acquainted," he said, "with the North Sea. You know that it is a comparatively small sea. It is fished by English, Scotch, Norwegian, Swedish, Danish, German, Dutch, Belgian, and French fish-

ermen, and I think I could prove to you (only it is unnecessary to go into statistics) that the fish which these fishermen are drawing from the North Sea is worth at least £25,000,000 every year. That sum, if I may translate the figures again into an intelligible language, is more than equal to the whole interest of the national debt of this country. This evening I am not concerned with the fisheries of Europe, but with the fish supply of London; and what I wish to point out to you, and what is very imperfectly understood, is the proportion of fish consumed in London which is drawn from the North Sea. I have tried to analyze the return as far as I am able to do so, and I find that, out of the 130,000 tons of fish which were received in London in 1880, in round numbers 100,000 tons came from the North Sea; that is to say that, out of every four fish which we eat in London, three came from the North Sea. Now, if this is the case, it is really essential to the subject for us to consider, however shortly, what is happening in the North Sea, because I know there is a prevalent impression that the North Sea itself and the seas of this kingdom generally are being over-fished, and that they are in consequence in danger of approaching exhaustion. I am bound to say that you will hear this allegation supported on good authority in Billingsgate, and that you may also hear it in many fishing villages on the coasts of England. Now I will give you my reasons for thinking that the North Sea and the seas of this country generally are not in danger of exhaustion. In the first place the prophecy of approaching exhaustion is not a new one. It has influenced the legislature for centuries, and it may be found in our literature since the days of the Tudors. I, for one, think that when you find a series of predictions which have uniformly proved false you may pretty well afford to disregard the same predictions when they are made in our own time. You can hardly enter into a drawing-room—you certainly cannot go into any company interested in fisheries—without hearing complaints of the scarcity of soles; and I do not deny that soles were exceptionally scarce last year. But I recollect that I was told myself at Scarborough forty-five years ago, in the year in which the Queen came to the throne, that a fisherman landed at Scarborough with a pair of soles, which he placed on the pier and said: 'There are the two last soles in the North Sea.' I do not deny that scarcity may occur again, as it undoubtedly occurred last year. But I regard such scarcities as temporary accidents and not as any permanent failure of the great source of fish supply."

Mr. Walpole then reminded his hearers that, like all other animals, man included, fish have a tendency to produce their numbers in greater ratio than their food is generated, and consequently the natural waste which is always going on in the sea is far more exhausting than any effect that multitudes of fishermen produce upon the fish. In the same way a warm or a cold summer has an enormous influence upon the abundance or upon the scarcity of animal and vegetable life. Some years, for instance, we talk of a plague of flies, of caterpillars, or of gnats. The

same thing goes on in the sea, and the minute forms of life upon which the fish feed are affected by the warmth or cold of particular years. When there is a defective production of these forms of alimentary life the fish are obliged to scatter in search of food, and are not collected together so as to be easily caught by the net or trawl. In conclusion, Mr. Walpole pointed out that, although man is singularly deficient in statistics bearing upon fish, it is possible to reason in some measure from the particular to the universal by examining the details of the herring fishing, with which we are more or less acquainted.

"We know," he continued, "that the Scotch fishermen on an average take one thousand million herrings a year. We know also that the Norwegian fishermen take from the North Sea another one thousand million herrings per annum, while I am sure that other fishermen who work the North Sea take at least another one thousand million. Therefore we may assume that the fishermen of Europe draw three thousand millions of herrings annually from the North Sea. I think it beyond doubt that the predacious fish and birds kill as many herrings annually as fishermen do, and therefore man and other enemies draw six thousand millions of herrings a year from the North Sea. Now I do not suppose that any one with the least acquaintance with the subject would say that all these enemies of the herring catch one in every hundred; but, to put myself beyond all possibility of error, I will assume they catch one in every two. Then at the end of the year the account must be, six thousand millions of herrings taken and six thousand millions left. Assuming that of those left half are females it is obvious that to maintain the stock these females must produce two herrings apiece to make twelve thousand millions next year. But a female herring does not lay two eggs; she lays from 20,000 to 30,000. Assuming that she lays 10,000 eggs, it is obvious that nature intends out of every 5,000 she lays that 4,999 should die. If it were not so the whole sea would be full of herrings."

The conclusion at which Mr. Walpole arrived is that "the North Sea is practically inexhaustible." These are encouraging words, and they are borne out by the evidence of Mr. Robert Hewett, who is the managing director of Hewett & Co., a limited company which owns eight steamers and sixty fishing smacks of its own, and has in addition nearly one hundred other fishing smacks under mortgage, and about thirty more associated with it. Mr. Hewett deposed that since 1864 the company which he manages—

"Have brought much more wet trawl fish to Billingsgate than any other firm or company; that the fleet under his control consists of 183 smacks; that the fleet fish during the night and in the morning put their catch, which is packed in boxes containing about ninety pounds of fish each, on board the steamers which wait upon them; that the boxes when taken on board the steamers are immediately put into the hold and buried in ice, and are thus brought direct to Billingsgate; that on

arriving at Billingsgate the fish, on the opening of the market at 5 a. m., is taken out of the hold, carried ashore, and sold box by box; that the amount realized by Hewett & Co. for wet trawl fish sold at Billingsgate during the last seven years amounts collectively to £1,210,409; that in the trade wet trawl fish are divided into two classes, prime and offal; that the prime consists of turbots, brill, soles, John Dorey, and red mullet; and offal of plaice, haddock, cod, skate, roker, whiting, sturgeon, hake, dabs, thornback, and gurnard; that a very large proportion of the offal brought to market by Hewett & Co. could not have been sent by rail, as it would not have fetched the rate charged for carriage; that if there was no water-carriage for fish to market nothing but the prime and the best of the offal would be sent to London at all."

The evidence of Mr. Hewett is deserving of special attention, because it is to him and to his father that Billingsgate is indebted for many valuable suggestions and improvements of the conduct of its trade. His father was the first to bring fish by water from the fleet in the North Sea direct to Billingsgate, and for this purpose he caused a line of fast-sailing carrier cutters to be built in 1843. Up to that time, and for many years previously, it was the custom to land considerable quantities of fish at Yarmouth, which were sent up to London by rail, while other lots were brought by river to Gravesend and despatched thence to Billingsgate by hatch-boat. From 1843 to 1864 the swift-sailing cutters worked with great success, but in the latter year they were "run off the road," not by the railways but by steam carriers which were then started. The first ten sailing carriers were built and put on by the elder Hewett in 1843 and 1844; the first six steamers by the younger Hewett in 1864 and 1865. There are now not less than twenty-one steam carriers running to London. They belong to several companies, each of them distinct from the others, and they work in connection with five large fleets in the North Sea. Nor ought we to omit mentioning that the bulk of the fish came to Billingsgate packed in baskets until 1856, when boxes were for the first time tried by Hewett & Co. Four years later baskets had entirely died out, and in 1860 all trawl fish came to market, as they do now, in boxes containing from ninety to a hundred pounds apiece.

Enough has been said to show what weight attaches to Mr. Robert Hewett's testimony, when he affirms, "as the result of many years experience," that double the quantity of fish now sold in London could readily be disposed of if there were but proper accommodations at the river-side to receive it. It is well known, he adds, by all who deal extensively in the coarser kinds of fish, that however large the supply the demand more than keeps pace with it, and that the price is never lowered. There can, in fact, be no doubt that if, as he anticipates, Mr. Hewett and his company can pour three or four hundred tons of roker every day into the metropolis through Shadwell market they will be conferring a benefit upon the poor of which it would be impossible to overstate the magnitude. Roker—by which all fish of the ray fam-

ily, excepting skate, are meant—is a favorite food of the working classes, to whom it could be supplied retail at three pence or less per pound. There are medical men, among whom Sir Henry Thompson and Dr. Priestley are, we believe, included, who hold that for delicate digestions nothing is so healthy and invigorating as a diet consisting almost exclusively of fish. But it is not in the interests of the rich that the enterprise was conceived which is about to give us a fish market with all the merits and none of the defects for which Billingsgate has long been noted. How can the value of a constant supply of fresh fish, obtainable at about one-fourth or one-fifth of the price exacted from him for fresh meat, be estimated and appraised by the workingman? The question is more than ever significant when it is borne in mind that there are many signs presaging a considerable rise in the price of beef, and still more of mutton, before the end of next year. According to the "Balance Sheet of the World," compiled by Mr. Michael G. Mulhall, F. S. S., Europe consumes annually 853,000 tons of meat beyond what she produces. From whence is England to derive her supplies of this precious commodity, which she produces at the rate of 1,205,000 tons and consumes at the rate of 1,800,000 tons per annum? To make up our yearly deficit, amounting to about 600,000 tons, the United States have, until lately, been the most liberal of our many contributors. But beef is at this moment as dear in New York as in London, and the power of the United States to supply England with meat is obviously declining. The rapid growth of the American population is enough to explain that, in a country already numbering about 55,000,000 inhabitants, 32,000,000 sheep and 13,000,000 bullocks are not much in excess of that country's own wants.

Doubtless we shall receive large consignments of frozen mutton from the Australian colonies; but years upon years will have to expire before the contributions from that source, added to others from Brazils, the Argentine Confederation, the River Plate, and possibly from Russia, will begin to make themselves sensibly felt in this country. The greatest perplexity, in short, with which statesmen can be threatened—a deficiency in one of the most essential staples of the nation's food—seems to be impending over Great Britain and Ireland. How is it to be met?

Lucan tells us in one of the finest passages of his Pharsalia, that Cæsar, upon returning to Rome, dismissed all thoughts of war from his breast, and addressed himself to the task of providing ample supplies of food for the fickle populace, conscious that it is famine alone which lashes cities into revolt, and that a "starving people knows no fear." Far be it from us to suggest that England is threatened, ever so remotely, with famine. But that beef and mutton are likely to rise in price is the undoubted opinion of our most competent authorities, and in the face of a serious deficiency in meat we can conceive nothing more useful or more welcome than a large and sustained addition to the fish supply of London.

IX.—THE EXTENT OF THE USE OF FISH GUANO AS A FERTILIZER.

By Chas. W. Smiley.

In the fall of 1879 the inquiry, "Is fish guano in any of its forms used by your farmers?" was addressed to every postmaster in the United States. From 30,022 returns, the following facts have been ascertained:

I. Fish guano is not used in any of the following twenty-one States and Territories: Alaska, 1; Arizona, 34; Arkansas, 435; Colorado, 161; Dakota, 184; Idaho, 45; Illinois, 1,154; Indiana, 792; Indian Territory, 46; Iowa, 836; Kansas, 749; Minnesota, 515; Missouri, 835; Montana, 64; Nebraska, 373; Nevada, 62; New Mexico, 54; Oregon, 211; Texas, 752; Utah, 113; and Wyoming, 46. The numbers given with each political division denote the number of negative replies received to the question, the total being 7,462, and covering every county in the divisions named.

II. In the following ten States and Territories there are indications of a very slight use of fish guano. In some cases the reporters may not have carefully distinguished between fish guano and other kinds, while others have evidently spoken of unmanufactured refuse of the fisheries. All reports that are believed to point to the use of fish in any form as a fertilizer are here quoted:

1. California.—"Shrimp shucks from San Francisco are used by Chinese gardeners to a considerable extent:" Grass Valley, Nevada County. "To some extent in vegetable and strawberry culture:" Santa Clara, Santa Clara County.

The following statement by A. W. Saxe, M. D., of Santa Clara, is of interest: "I know of no one in this vicinity using fish as a fertilizer, except Judge D. C. Thomas, who was induced to try it by Mr. A. Barstow, of San Francisco. The material is mostly dried shrimps and waste of codfish and salmon. On strawberry land he uses from 300 to 400 pounds per acre. It pays well in the increased yield and finer quality of fruit. In 1879 he used ten tons on his extensive strawberry plantation, and would have used more if he could have gotten it. He sows it broadcast on the land after the first plowing and cultivates it into the soil. It stimulates vegetation wonderfully. It is gathered by the Chinese fishermen at or near Point Arena, in Mendocino County, put up in bales after being sun-dried and shipped to China, probably to be

used as a fertilizer but possibly as food, as there is nothing of organic nature the Chinaman will not eat. These bales weigh from 300 to 400 pounds each. The farmers in the vicinity of Point Arena have used it to some extent on wheat lands, and report it as increasing the crop from 30 to 50 per cent. At one time they used all they could get at the original price demanded by the Chinese; but the latter soon raised the price from $8 to $12 per ton, and it has not since been in as general use there as formerly."

"Nearly all farmers in the valley use it, obtaining it from Sacramento and San Francisco": Etna Mills, Siskiyou County. The foregoing constitute the affirmative reports. There are 486 negative reports on file from this State.

2. KENTUCKY.—"A very little used, which is obtained at our county seat, being brought from New York, Cincinnati, and Louisville": Wade's Mill, Clark County. "A little for experiment": Frankfort, Franklin County. "Very little is used, being obtained from Baltimore, Md., and Savannah, Ga.": Pulaski, Somerset County. There are 594 negative reports from this State.

3. LOUISIANA.—"Three hundred tons, obtained from Charleston, S. C., were used in 1880, principally by the Ames plantation": Gretna, Jefferson County. There are 205 negative reports from Louisiana.

4. MICHIGAN.—"What we use we manufacture ourselves, but are ignorant of the true way of doing it": Skanee, Baraga County. "A small amount, obtained at Grand Rapids and Jackson, is used, and by 15 or 20 men": Morgan, Bay County. "Fishermen use fish guano on their gardens somewhat; none bought or sold here": Mackinaw City, Cheboygan County. "Winegar, Miller & Co. use it on their farm at Martin's Island, Delta County": Escanaba, Delta County. "Only when fish are found dead on the lake shore, as is sometimes the case": Bear Lake, Manistee County. "What little is used here is bought by our farmers at Grand Rapids, 16 miles distant": South Blendon, Ottawa County. The number of negative reports from this State is 819.

5. MISSISSIPPI.—"The fish is used as a fertilizer": Bay Saint Louis, Hancock County. "Salt water sardines are used for guano and are very plentiful": Scranton, Jackson County. There are 332 negative reports from this State.

6. OHIO.—"Not in any quantity; $150 per year is about the limit": Powhatan Point, Belmont County. "They use fish for fertilizer on the lake shore": Dover, Cuyahoga County. "Offal from fish house and worthless fish are used on the fields": Vermillion, Erie County. "Fertilizers are used quite extensively, fish guano forming a part": Barlow, Washington County. "Yes": Toledo, Lucas County. The number of negative answers from Ohio is 1,228.

7. TENNESSEE.—"It is": Asbury, Knox County. "Yes, it is being used of late by quite a number of farmers. I suppose that at least 500 farmers, averaging to use 800 pounds each, and living in this vicinity,

employed it in the year 1880": Cash Point, Lincoln County. "In exceptional cases; it has not been introduced extensively": Muddy Creek, Loudon County. "It is; farmers buy it at Knoxville," Unitia, Loudon County. "Yes; four farmers used 80 tons in 1880; they bought it at Knoxville": Wave Hill, Union County. "Yes; about twenty-five men used 500 pounds in 1880; it was obtained at Richmond, Va.": Fain's, Washington County. There are 589 negative reports from Tennessee.

8. WASHINGTON.—"It is by those living near the sound": Kamilche, Mason County. "Carcasses of dogfish and the refuse of herring fisheries are used by gardeners on Fillalgo Island": Artondale, Pierce County. "Yes; a little": Sumner, Pierce County. "In some cases": Lowell, Snohomish County. "In some cases; as a rule, our farmers have not utilized fish guano": Olympia, Thurston County. "In limited quantities: from Cypress Island fisheries": Anacortes, Whatcom County. "There has been little fish scrap used by a few with good results": Fidalgo, Whatcom County. "It is": Semiahmoo, Whatcom County. There have 121 negative reports been received from Washington.

9. WEST VIRGINIA.—"A little from Delaware": Capon Bridge, Hampshire County. "About two tons were used in 1880, being obtained from Winchester, Va.": Dillon's Run, Hampshire County. "About one-fourth of all guano used here is fish guano; nearly all farmers use some kind of guano; it is obtained from Winchester, Va.": Hanging Rock, Hampshire County. At Mutton Run and other places in Hampshire County there is also evidence of the use of fish guano. "Fish guano is but little used here, though I have seen it occasionally in the market:" Kendalia, Kanawha County. "In 1880 six farmers used about five sacks each of fish guano obtained in Baltimore": Racoon, Preston County. There are also affirmative answers from Crump's Bottom, Summers County, and from Kanawha Station, Wood County. There are 381 negative reports from all parts of the State.

10. WISCONSIN.—"There has been considerable fish guano used in this county; it is a valuable fertilizer in Bailey's Harbor, Gibraltar, Jacksonport, and Sturgeon Bay; they have used the culled fish with great success for several years past, but in 1880 the fishermen found market for most all kinds of fish:" Ellison Bay, Door County. "Yes:" Naugart, Marathon County. "The offal of the fisheries is utilized to some extent by the farmers near by": Menekaunee, Marinette County. Seven hundred and forty-two negative reports are on file from this State.

III. In seventeen States a somewhat extensive use of fish guano is reported. Assuming that the percentage of Territory corresponds with the percentage of affirmative and of negative replies to the question, the use of fish guano would extend over—

1. 18 per cent. of the territory of Pennsylvania.
2. 24 per cent. of the territory of New York.

3. 30 per cent. of the territory of New Hampshire.
4. 32 per cent. of the territory of North Carolina.
5. 33 per cent. of the territory of Vermont.
6. 36 per cent. of the territory of Alabama.
7. 45 per cent. of the territory of Virginia.
8. 46 per cent. of the territory of Maine.
9. 46 per cent. of the territory of Georgia.
10. 48 per cent. of the territory of South Carolina.
11. 50 per cent. of the territory of Maryland.
12. 51 per cent. of the territory of Florida.
13. 58 per cent. of the territory of New Jersey.
14. 60 per cent. of the territory of Massachusetts.
15. 69 per cent. of the territory of Delaware.
16. 79 per cent. of the territory of Connecticut.
17. 86 per cent. of the territory of Rhode Island.

Taking up each of these States by the nine sections into which they have been divided by the Post-Office Department, and specifying the number of counties in which this fertilizer is used, the percentage of territory on which it is reported would be exhibited by the following tables:

1.—Pennsylvania.

Fish guano is used in 58 of its 67 counties and on 18 per cent. of its territory:

NORTHWESTERN, WESTERN, AND SOUTHWESTERN COUNTIES.

	Per cent.
In 4 of the 5 northwestern counties	13
In the 8 western counties	9
In the 6 southwestern counties	8
	10

NORTHERN, CENTRAL, AND SOUTHERN COUNTIES.

	Per cent.
In 5 of the 7 northern counties	11
In 12 of the 16 central counties	12
In 5 of the six southern counties	22
	15

NORTHEASTERN, EASTERN, AND SOUTHEASTERN COUNTIES.

	Per cent.
In the 3 northeastern counties	8
In 7 of the 8 eastern counties	16
In the 8 southeastern counties	40
	21

2.—New York.

Fish guano is used in all the counties of the State except Lewis and Warren, and on 24 per cent. of its territory:

WESTERN AND SOUTHWESTERN COUNTIES.[1]

	Per cent.
In 10 western counties	25
In 5 southwestern counties	13
	19

NORTHERN, CENTRAL, AND SOUTHERN COUNTIES.

	Per cent.
In 3 of the 4 northern counties	15
In 9 central counties	17
In 4 southern counties	13
	15

NORTHEASTERN, EASTERN, AND SOUTHEASTERN COUNTIES.

	Per cent.
In 4 of the 5 northeastern counties	09
In 8 eastern counties	23
In 15 southeastern counties	40
	24

3.—New Hampshire.

Fish guano is used in all the counties of this State, and on 30 per cent. of its territory:

SOUTHWESTERN COUNTIES.[2]

	Per cent.
In 2 southwestern counties	30

NORTHERN, CENTRAL, AND SOUTHERN COUNTIES.

	Per cent.
In 1 northern county	30
In 3 central counties	31
In 2 southern counties	28
	29

SOUTHEASTERN COUNTIES.[3]

	Per cent.
In 2 southeastern counties	35

4.—North Carolina.

Fish guano is used in 75 of the 94 counties of this State, and on 32 per cent. of its territory:

NORTHWESTERN, WESTERN, AND SOUTHWESTERN COUNTIES.

	Per cent.
In 3 of the 6 northwestern counties	10
In 8 of the 12 western counties	19
In 9 of the 16 southwestern counties	18
	15

[1] There are no northwestern counties.

[2] There are no northwestern nor western counties.

[3] There are no northeastern nor eastern counties.

NORTHERN, CENTRAL, AND SOUTHERN COUNTIES.

	Per cent.
In the 12 northern counties	33
In 13 of the 14 central counties	38
In the 7 southern counties	41
	37

NORTHEASTERN, EASTERN, AND SOUTHEASTERN COUNTIES.

	Per cent.
In 11 of the 12 northeastern counties	60
In 10 of the 12 eastern counties	45
In 2 of the 3 southeastern counties	21
	42

5.—VERMONT.

Fish guano is used in all the counties of this State, and on 33 per cent. of its territory:

NORTHWESTERN, WESTERN, AND SOUTHWESTERN COUNTIES.

	Per cent.
In 2 of the 3 northwestern counties	17
In 2 western counties	14
In 1 southwestern county	28
	19

NORTHERN AND CENTRAL COUNTIES.[4]

	Per cent.
In 2 northern counties	40
In 1 central county	33
	36

NORTHEASTERN, EASTERN, AND SOUTHEASTERN COUNTIES.

	Per cent.
In 2 northeastern counties	38
In 2 eastern counties	43
In 1 southeastern county	75
	45

6.—ALABAMA.

Fish guano is used in 55 of the 66 counties of this State, and on 36 per cent. of its territory:

NORTHWESTERN, WESTERN, AND SOUTHWESTERN COUNTIES.

	Per cent.
In 4 of the 9 northwestern counties	16
In the 5 western counties	29
In 5 of the 7 southwestern counties	11
	19

NORTHERN, CENTRAL, AND SOUTHERN COUNTIES.

	Per cent.
In the 8 northern counties	47
In 7 of the 9 central counties	38
In 7 of the 8 southern counties	27
	37

[4] There are no southern counties.

NORTHEASTERN, EASTERN, AND SOUTHEASTERN COUNTIES.

	Per cent.
In the 5 northeastern counties	32
In the 7 eastern counties	71
In 7 of the 8 southeastern counties	52
	51

7.—VIRGINIA.

Fish guano is used in 84 of the 99 counties of this State, and on 45 per cent. of its territory:

WESTERN AND SOUTHWESTERN COUNTIES.[5]

	Per cent.
In 5 of the 7 western counties	26
In 9 of the 17 southwestern counties	9
	17

NORTHERN, CENTRAL, AND SOUTHERN COUNTIES.

	Per cent.
In 14 of the 15 northern counties	42
In 18 of the 20 central counties	45
In the 13 southern counties	49
	45

EASTERN AND SOUTHEASTERN COUNTIES.[6]

	Per cent.
In 17 of the 19 eastern counties	88
In the 8 southeastern counties	67
	77

8.—MAINE.

Fish guano is used in every county of Maine, and on 46 per cent. of its territory. In some parts of this State lobster shells are used as a fertilizer:

WESTERN AND SOUTHWESTERN COUNTIES.[7]

	Per cent.
In 2 western	26
In 6 southwestern	49
	37

CENTRAL AND SOUTHERN COUNTIES.[8]

	Per cent.
In 2 central counties	25
In 4 southern counties	64
	44

NORTHEASTERN AND EASTERN.[9]

	Per cent.
In 1 northeastern county	3
In 1 eastern county	76
	39

[5] There are no northwestern counties.
[6] There are no northeastern counties.
[7] There are no northwestern counties.
[8] There are no northern counties.
[9] There are no southeastern counties.

9.—Georgia.

Fish guano is used in 99 of the 137 counties of Georgia, and on 46 per cent. of its territory:

NORTHWESTERN, WESTERN, AND SOUTHWESTERN.

	Per cent.
In 11 of the 12 northwestern counties	45
In 17 of the 21 western counties	54
In 7 of the 16 southwestern counties	48
	49

NORTHERN, CENTRAL, AND SOUTHERN COUNTIES.

	Per cent.
In 14 of the 19 northern counties	40
In 18 of the 23 central counties	55
In 8 of the 13 southern counties	37
	44

NORTHEASTERN, EASTERN, AND SOUTHEASTERN COUNTIES.

	Per cent.
In 7 of the 10 northeastern counties	39
In 7 of the 11 eastern counties	43
In 10 of the 12 southeastern counties	45
	42

10.—South Carolina.

Fish guano is used in all the counties of this State except Chesterfield and Georgetown Counties, and on 48 per cent. of its territory:

NORTHWESTERN AND WESTERN COUNTIES.[10]

	Per cent.
In 6 northwestern counties	53
In 4 western counties	52
	52

NORTHERN, CENTRAL, AND SOUTHERN COUNTIES.

	Per cent.
In 6 northern counties	47
In 5 central counties	43
In 4 southern counties	38
	42

NORTHEASTERN AND EASTERN COUNTIES.[11]

	Per cent.
In 5 northeastern counties	44
In 3 eastern counties	45
	44

11.—Maryland.

Fish guano is used in all the counties of this State except Alleghany County, and on 50 per cent. of its territory:

NORTHWESTERN COUNTIES.[12]

	Per cent.
In 4 northwestern counties	29

[10] There are no southwestern counties.
[11] There are no southeastern counties.
[12] There are no western nor southwestern counties.

NORTHERN, CENTRAL, AND SOUTHERN COUNTIES.

	Per cent.
In 3 northern counties	43
In 4 central counties	39
In 3 southern counties	71
	51

NORTHEASTERN, EASTERN, AND SOUTHEASTERN COUNTIES.

	Per cent.
In 2 northeastern counties	52
In 3 eastern counties	52
In 4 southeastern counties	93
	65

12.—FLORIDA.

Fish guano is used in all but 11 of the 39 counties of this State, and 51 per cent. of its territory:

NORTHWESTERN COUNTIES.[13]

	Per cent.
In 7 of the 10 northwestern counties	40

NORTHERN, CENTRAL, AND SOUTHWESTERN COUNTIES.

	Per cent.
In 7 of the 12 northern counties	31
In 6 of the 7 central counties	60
In 1 of the 2 southwestern counties	27
	39

NORTHEASTERN AND EASTERN COUNTIES.[14]

	Per cent.
In 5 northeastern counties	65
In 2 eastern counties	76
	70

13.—NEW JERSEY.

Fish guano is used in all the counties of this State, and on 58 per cent. of its territory:

NORTHWESTERN AND SOUTHWESTERN COUNTIES.[15]

	Per cent.
In 2 northwestern counties	32
In 4 southwestern counties	84
	58

NORTHERN, CENTRAL, AND SOUTHERN COUNTIES.

	Per cent.
In 3 northern counties	24
In 6 central counties	74
In 2 southern counties	100
	66

NORTHEASTERN COUNTIES.[16]

	Per cent.
In 4 northeastern counties	31

[13] There are no western nor southwestern counties.

[14] There are no southeastern counties.

[15] There are no western counties.

[16] There are no eastern nor southeastern counties.

14.—Massachusetts.

Fish guano is used in all the counties of this State, and on 60 per cent. of its territory:

NORTHWESTERN, WESTERN, AND SOUTHWESTERN COUNTIES.

	Per cent.
In 1 northwestern county	73
In 2 western counties	48
In 1 southwestern county	80
	67

CENTRAL COUNTY.[17]

	Per cent.
In 1 central county	38

NORTHEASTERN, EASTERN, AND SOUTHEASTERN COUNTIES.

	Per cent.
In 1 northeastern county	69
In 3 eastern counties	55
In 5 southeastern counties	74
	66

15.—Delaware.

Fish guano is used in all of the counties of Delaware, and on 69 per cent. of its territory:

NORTHERN, CENTRAL, AND SOUTHERN COUNTIES.[18]

	Per cent.
In 1 northern county	56
In 1 central county	78
In 1 southern county	75
	69

16.—Connecticut.

Fish guano is used in all the counties of Connecticut, and on 79 per cent. of its territory:

NORTHWESTERN AND SOUTHWESTERN COUNTIES.[19]

	Per cent.
In 1 northwestern county	56
In 1 southwestern county	66
	61

NORTHERN AND SOUTHERN COUNTIES.[20]

	Per cent.
In 2 northern counties	88
In 2 southern counties	100
	94

[17] There are no northern nor southern counties.

[18] There are no northwestern, western, southwestern, northeastern, eastern, nor southeastern counties.

[19] There are no western counties.

[20] There are no central counties.

NORTHEASTERN AND SOUTHEASTERN COUNTIES.[21]

	Per cent.
In 1 northeastern county	56
In 1 southeastern county	90
	73

17.—RHODE ISLAND.

Fish guano is used in all the counties of Rhode Island, and on 86 per cent. of its territory:

NORTHERN, CENTRAL, AND SOUTHERN COUNTIES.[22]

	Per cent.
In 1 northern county	86
In 1 central county	67
In 1 southern county	92
	82

EASTERN AND SOUTHEASTERN COUNTIES.[23]

	Per cent.
In 1 eastern county	100
In 1 southeastern county	100
	100

For the purpose of exhibiting in full the data from which the foregoing percentages were derived, tables will now be given showing the exact number of affirmative and of negative answers received from each county in the seventeen States under consideration and arranged by sections:

1. PENNSYLVANIA.

Offices interrogated.	Counties.	Number of replies. Yes.	No.	Total.
	CENTRAL COUNTIES (16).			
32	Blair	1	20	21
30	Cambria	2	16	18
46	Center	2	27	29
56	Clearfield	3	30	33
43	Columbia	7	10	17
37	Dauphin	6	15	21
17	Elk		9	9
58	Huntingdon	1	28	29
28	Juniata	3	12	15
58	Lycoming		25	25
22	Mifflin		11	11
7	Montour	1	4	5
43	Northumberland	7	21	28
38	Perry	2	16	18
25	Snyder		14	14
29	Union	2	11	13
562		37	269	306
	NORTHERN COUNTIES (7).			
106	Bradford	8	48	56
8	Cameron	1	6	7
33	Clinton	4	13	17
44	McKean	2	24	26
43	Potter		14	14
19	Sullivan		10	10
69	Tioga	3	33	36
322		18	148	166

[21] There are no eastern counties.

[22] There are no northwestern, western, nor southwestern counties.

[23] There are no northeastern counties.

1. PENNSYLVANIA—Continued.

Offices interrogated.	Counties.	Number of replies.		
		Yes.	No.	Total.
	NORTHEASTERN COUNTIES (3).			
66	Susquehanna	4	38	42
51	Wayne	1	26	27
35	Wyoming	2	17	19
152		7	81	88
	EASTERN COUNTIES (8).			
26	Carbon		12	12
42	Lackawanna	6	23	29
58	Lehigh	3	32	35
78	Luzerne	7	38	45
34	Monroe	3	11	14
46	Northampton	3	20	23
17	Pike	3	7	10
74	Schuylkill	7	29	36
375		32	172	204
	SOUTHEASTERN COUNTIES (8).			
112	Berks	10	39	49
95	Bucks	33	25	58
126	Chester	26	40	66
46	Delaware	12	8	20
147	Lancaster	16	52	68
30	Lebanon	1	16	17
99	Montgomery	29	15	44
20	Philadelphia	3	2	5
675		130	197	327
	SOUTHERN COUNTIES (6).			
38	Adams	7	12	18
49	Bedford	5	20	25
42	Cumberland	2	23	25
43	Franklin	4	18	22
26	Fulton		13	13
93	York	16	32	48
291		34	118	152
	SOUTHWESTERN COUNTIES (6).			
93	Allegheny	3	26	29
45	Fayette	2	24	26
51	Greene	3	18	21
50	Somerset	1	24	25
84	Washington	3	26	29
85	Westmoreland	3	48	51
408		15	166	181
	WESTERN COUNTIES (8).			
56	Armstrong	2	30	32
43	Beaver	2	19	21
55	Butler	1	22	23
52	Clarion	2	26	28
59	Indiana	4	26	30
34	Jefferson	1	16	17
25	Lawrence	1	6	7
46	Mercer	3	22	25
370		16	167	183
	NORTHWESTERN COUNTIES (5).			
66	Crawford	6	31	37
49	Erie	5	24	29
16	Forest		10	10
59	Venango	2	23	25
36	Warren	3	20	23
226		16	108	124

1. PENNSYLVANIA—Continued.

Offices interrogated.	Counties.	Number of replies. Yes.	No.	Total.
	RECAPITULATION.			
562	Central counties	37	269	306
322	Northern counties	18	148	166
152	Northeastern counties	7	81	88
375	Eastern counties	32	172	204
675	Southeastern counties	130	197	327
291	Southern counties	34	118	152
408	Southwestern counties	15	166	181
370	Western counties	16	167	183
226	Northwestern counties	16	108	124
3,381		305	1,426	1,731

2. NEW YORK.

	CENTRAL COUNTIES (9).			
58	Cayuga	13	22	35
49	Chenango	3	25	28
34	Cortland	3	12	15
51	Madison	1	24	25
85	Oneida	7	32	39
75	Onondaga	5	35	40
76	Oswego	7	31	38
63	Otsego	6	36	42
25	Seneca	2	16	18
516		47	233	280
	NORTHERN COUNTIES (4).			
45	Herkimer	5	18	23
66	Jefferson	7	33	40
44	Lewis		20	20
76	Saint Lawrence	7	33	40
231		19	104	123
	NORTHEASTERN COUNTIES (5).			
42	Clinton	2	21	23
42	Essex	1	19	20
31	Franklin	3	14	17
12	Hamilton	1	5	6
26	Warren		13	13
153		7	72	79
	EASTERN COUNTIES (8).			
52	Albany	5	15	20
32	Fulton	6	14	20
32	Montgomery	3	15	18
53	Rensselaer	9	21	30
59	Saratoga	5	24	29
13	Schenectady	1	4	5
44	Schoharie	6	15	21
57	Washington	4	23	27
342		39	131	170
	SOUTHEASTERN COUNTIES (15).			
62	Columbia	6	25	31
72	Delaware	7	34	41
102	Duchess	19	33	52
41	Greene	2	13	15
14	Kings	10	1	11
11	New York			
69	Orange	8	26	34
18	Putnam	2	9	11
59	Queens	27	7	34
15	Richmond	6	5	11
25	Rockland	4	11	15
83	Suffolk	61	3	64
66	Sullivan	1	38	39
77	Ulster	5	29	34
68	Westchester	14	24	38
782		172	258	430

2. NEW YORK—Continued.

Offices interrogated.	Counties.	Number of replies. Yes.	No.	Total.
	SOUTHERN COUNTIES (4).			
57	Broome	2	26	28
26	Chemung	2	17	19
36	Tioga	3	15	18
42	Tompkins	4	13	17
161		11	71	82
	SOUTHWESTERN COUNTIES (5).			
58	Allegany	1	31	32
63	Cattaraugus	6	34	40
61	Chatauqua	5	28	33
31	Schuyler	4	8	12
81	Steuben	5	40	45
294		21	141	162
	WESTERN COUNTIES (10).			
91	Erie	8	32	40
32	Genesee	4	11	15
40	Livingston	6	22	28
51	Monroe	7	21	28
49	Niagara	2	19	21
43	Ontario	7	13	20
37	Orleans	3	11	14
44	Wayne	12	13	25
38	Wyoming	5	20	25
26	Yates	5	11	16
451		59	173	232
	RECAPITULATION.			
516	Central counties	47	233	280
231	Northern counties	19	104	123
153	Northeastern counties	7	72	79
342	Eastern counties	39	131	170
782	Southeastern counties	172	258	430
161	Southern counties	11	71	82
294	Southwestern counties	21	141	162
451	Western counties	59	173	232
2,930		375	1,183	1,558

3. NEW HAMPSHIRE.

	CENTRAL COUNTIES (3).			
23	Belknap	4	9	13
57	Carroll	14	23	37
67	Grafton	11	33	44
141		29	65	94
	NORTHERN COUNTIES (1).			
34	Coos	6	14	20
	SOUTHEASTERN COUNTIES (2).			
65	Rockingham	12	28	40
26	Strafford	7	8	15
91		19	36	55
	SOUTHERN COUNTIES (2).			
51	Hillsborough	10	29	39
58	Merrimack	11	26	37
109		21	55	76

3. NEW HAMPSHIRE—Continued.

Offices interrogated.	Counties.	Number of replies.		
		Yes.	No.	Total.
	SOUTHWESTERN COUNTIES (2).			
46	Cheshire	10	19	29
35	Sullivan	6	19	25
81		16	38	54
	RECAPITULATION.			
141	Central counties	29	65	94
34	Northern counties	6	14	20
91	Southeastern counties	19	36	55
109	Southern counties	21	55	76
81	Southwestern counties	16	38	54
456		91	208	299

4. NORTH CAROLINA.

	CENTRAL COUNTIES (14).			
35	Chatham	7	10	17
18	Cumberland		6	6
20	Davidson	3	6	9
16	Duplin	1	10	11
13	Harnett	4	5	9
18	Johnston	7		7
20	Montgomery	3	7	10
29	Moore	4	8	12
47	Randolph	5	17	22
20	Sampson	3	7	10
10	Stanley	2	2	4
31	Wake	9	4	13
9	Wayne	2	2	4
7	Wilson	2	1	3
293		52	85	137
	NORTHERN COUNTIES (12).			
23	Alamance	2	12	14
14	Caswell	2	8	10
19	Forsyth	2	6	8
8	Franklin	4	1	5
18	Granville	6	6	12
25	Guilford	3	10	13
8	Nash	3	1	4
14	Orange	1	7	8
16	Person	1	5	6
22	Rockingham	4	6	10
23	Stokes	2	9	11
13	Warren	5	1	6
203		35	72	107
	NORTHEASTERN COUNTIES (12).			
9	Bertie	4	3	7
6	Camden	1	1	2
4	Chowan		3	3
9	Currituck	3	4	7
6	Edgecombe	3	1	4
11	Gates	3		3
17	Halifax	7	5	12
8	Hertford	3	1	4
7	Martin	3	3	6
8	Northampton	4	3	7
2	Pasquotank	2		2
5	Perquimans	4	1	5
92		37	25	62

4. NORTH CAROLINA—Continued.

Offices interrogated.	Counties.	Number of replies. Yes.	No.	Total.
	EASTERN COUNTIES (12).			
16	Beaufort	6	2	8
10	Carteret	4	3	7
8	Craven	4	2	6
8	Dare	2	2	4
8	Greene	1	2	3
11	Hyde		9	9
6	Jones		3	3
7	Lenoir	2	2	4
8	Pamlico	2	3	5
11	Pitt	3	5	8
3	Tyrrell	2		2
7	Washington	2	1	3
103		28	34	62
	SOUTHEASTERN COUNTIES (3).			
1	New Hanover		1	1
13	Onslow	1	4	5
18	Pender	2	6	8
32		3	11	14
	SOUTHERN COUNTIES (7).			
19	Anson	5	4	9
28	Bladen	1	11	12
7	Brunswick	1	4	5
20	Columbus	1	5	6
15	Richmond	5	3	8
24	Robeson	4	9	13
23	Union	9	2	11
136		26	38	64
	SOUTHWESTERN COUNTIES (16).			
14	Cabarrus	2	4	6
15	Cherokee		6	6
4	Clay		4	4
20	Cleaveland	2	7	9
14	Gaston	4	5	9
3	Graham		2	2
15	Haywood		9	9
14	Henderson	1	6	7
16	Jackson		9	9
11	Lincoln	1	2	3
9	Macon		6	6
18	Mecklenburg	5	3	8
13	Polk		5	5
20	Rutherford	1	9	10
6	Swain	1	2	3
11	Transylvania	1	4	5
203		18	83	101
	WESTERN COUNTIES (12).			
9	Alexander	1	6	7
26	Buncombe	1	7	8
15	Burke	1	4	5
14	Caldwell		4	4
16	Catawba	4	6	10
13	Davie	1	7	8
30	Iredell	5	9	14
12	McDowell		5	5
23	Madison	3	6	9
17	Mitchell		11	11
20	Rowan	2	8	10
15	Yancey		3	3
210		18	76	94

4. NORTH CAROLINA—Continued.

Offices interrogated.	Counties.	Number of replies. Yes.	No.	Total.
	NORTHWESTERN COUNTIES (6).			
9	Alleghany	.....	2	2
24	Ashe	.....	17	17
22	Surry	2	11	13
20	Watauga	1	5	6
31	Wilkes	.....	14	14
17	Yadkin	3	4	7
123		6	53	59
	RECAPITULATION.			
293	Central counties	52	85	137
203	Northern counties	35	72	107
92	Northeastern counties	37	25	62
103	Eastern counties	28	34	62
32	Southeastern counties	3	11	14
136	Southern counties	26	38	64
203	Southwestern counties	18	83	101
210	Western counties	18	76	94
123	Northwestern counties	6	53	59
1,395		223	477	700

5. VERMONT.

	CENTRAL COUNTIES (1).			
33	Washington	8	16	24
	NORTHERN COUNTIES (2).			
20	Lamoille	1	15	16
40	Orleans	17	12	29
60		18	27	45
	NORTHEASTERN COUNTIES (2).			
39	Caledonia	6	16	22
18	Essex	7	5	12
57		13	21	34
	EASTERN COUNTIES (2).			
44	Orange	11	18	29
53	Windsor	17	19	36
97		28	37	65
	SOUTHEASTERN COUNTIES (1).			
47	Windham	17	14	31
	SOUTHWESTERN COUNTIES (1).			
35	Bennington	7	18	25
	WESTERN COUNTIES (2).			
41	Addison	1	23	24
49	Rutland	6	19	25
90		7	42	49
	NORTHWESTERN COUNTIES (3).			
27	Chittenden	3	14	17
41	Franklin	4	17	21
10	Grand Isle	.....	4	4
78		7	35	42

5. VERMONT—Continued.

Offices interrogated.	Counties.	Number of replies. Yes.	No.	Total.
	RECAPITULATION.			
33	Central counties	8	16	24
60	Northern counties	18	27	45
57	Northeastern counties	13	21	34
97	Eastern counties	28	37	65
47	Southeastern counties	17	14	31
35	Southwestern counties	7	18	25
90	Western counties	7	42	49
78	Northwestern counties	7	35	42
497		105	210	315

6. ALABAMA.

	CENTRAL COUNTIES (9).			
8	Autauga	1	1	2
14	Bibb	4	4	8
10	Chilton	3	3	6
16	Coosa	4	6	10
13	Elmore		2	2
34	Jefferson	5	11	16
15	Perry		4	4
18	Shelby	5	4	9
20	Talladega	3	6	9
148		25	41	66
	NORTHERN COUNTIES (8).			
22	Blount	9	6	15
9	Cullman	1	3	4
16	Etowah	2	2	4
17	Limestone	5	4	9
24	Madison	5	8	13
19	Marshall	6	2	8
21	Morgan	2	11	13
23	Saint Clair	6	5	11
151		36	41	77
	NORTHEASTERN COUNTIES (5).			
20	Calhoun	4	6	10
27	Cherokee	8	10	18
19	Cleburne	3	3	6
26	De Kalb	2	5	7
35	Jackson	1	15	16
127		18	39	57
	EASTERN COUNTIES (7).			
14	Chambers	3	3	6
22	Clay	5		5
13	Lee	3	2	5
11	Macon	2	2	4
19	Randolph	5	3	8
12	Russell	3		3
18	Tallapoosa	6	1	7
109		27	11	38
	SOUTHEASTERN COUNTIES (8).			
22	Barbour	4	5	9
17	Bullock	6	5	11
3	Coffee	2	1	3
13	Dale	4	2	6
7	Geneva	4	1	5
13	Henry	3	1	4
13	Montgomery		4	4
15	Pike	2	4	6
108		25	23	48

6. ALABAMA—Continued.

Offices interrogated.	Counties.	Number of replies.		
		Yes.	No.	Total.
	SOUTHERN COUNTIES (8).			
12	Butler	3	3	6
14	Conecuh	5	2	7
13	Covington		2	2
15	Crenshaw	3	4	7
21	Dallas	1	12	13
12	Escambia	1	8	9
12	Lowndes	2	9	11
18	Wilcox	2	7	9
117		17	47	64
	SOUTHWESTERN COUNTIES (7).			
14	Baldwin	1	8	9
16	Choctaw		8	8
20	Clarke	2	8	10
22	Marengo		10	10
13	Mobile	1	9	10
17	Monroe	1	6	7
7	Washington	1	1	2
109		6	50	56
	WESTERN COUNTIES (5).			
10	Greene	1	3	4
16	Hale	1	7	8
19	Pickens	3	6	8
13	Sumter	1	9	10
28	Tuscaloosa	7	4	11
86		12	29	41
	NORTHWESTERN COUNTIES (9).			
13	Colbert	1	9	10
21	Fayette	5	7	12
12	Franklin		3	3
14	Lamar		4	4
12	Lauderdale	1	7	8
15	Lawrence	2	7	9
16	Marion		5	5
11	Winston		2	2
22	Walker		4	4
136		9	48	57
	RECAPITULATION.			
148	Central counties	25	41	66
151	Northern counties	36	41	77
127	Northeastern counties	18	39	57
109	Eastern counties	27	11	38
108	Southeastern counties	25	23	48
117	Southern counties	17	47	64
109	Southwestern counties	6	50	56
86	Western counties	12	29	41
136	Northwestern counties	9	48	57
1,091		175	329	504

7. VIRGINIA.

	CENTRAL COUNTIES (20).			
35	Albemarle	4	12	16
12	Amelia	3	2	5
20	Amherst		2	2
15	Appomattox	2	3	5
40	Bedford	4	11	15
20	Buckingham	7	7	14
22	Campbell	5	7	12
20	Caroline	0		0

7. VIRGINIA—Continued.

Offices interrogated.	Counties.	Number of replies. Yes.	No.	Total.
	CENTRAL COUNTIES—Continued.			
15	Chesterfield	3	6	9
14	Cumberland	3	1	4
12	Fluvanna	5	4	9
18	Goochland	5	4	9
4	Greene	0	0	0
22	Hanover	3	6	9
9	Henrico	1		1
25	Louisa	9	6	15
21	Nelson	1	12	13
17	Orange	5	3	8
11	Powhatan	3	1	4
20	Spottsylvania	4	2	6
372		73	89	162
	NORTHERN COUNTIES (15).			
2	Alexandria	2		2
7	Clarke	1	2	3
19	Culpeper	4	2	6
30	Fairfax	10	5	15
32	Fauquier	6	13	19
28	Frederick	5	6	11
36	Loudoun	9	14	23
13	Madison	1	7	8
13	Page	3	3	6
26	Prince William	7	7	14
10	Rappahannock		4	4
41	Rockingham	6	15	21
33	Shenandoah	8	12	20
11	Stafford	4	1	5
11	Warren	2	1	3
312		68	92	160
	EASTERN COUNTIES (19).			
31	Accomack	17	1	18
7	Charles City	1	3	4
3	Elizabeth City	3		3
16	Essex	12		12
10	Gloucester	2		2
4	James City	2		2
12	King and Queen	10		10
14	King George	7	2	9
12	King William	3	3	6
11	Lancaster	9		9
7	Matthews	5		5
12	Middlesex	9		9
7	New Kent		3	3
13	Northampton	4	2	6
10	Northumberland	6		6
9	Richmond	7		7
1	Warwick	0	0	0
16	Westmoreland	11		11
3	York	2	1	3
198		110	15	125
	SOUTHEASTERN COUNTIES (8).			
7	Isle of Wight	3	1	4
14	Nansemond	7	1	8
12	Norfolk	5	1	6
10	Prince George	4	2	6
7	Princess Ann	2	2	4
20	Southampton	9	2	11
12	Surry	5	4	9
11	Sussex	2	5	7
93		37	18	55

7. VIRGINIA—Continued.

Offices interrogated.	Counties.	Number of replies. Yes.	No.	Total.
	SOUTHERN COUNTIES (13).			
19	Brunswick	3	4	7
20	Charlotte	8	9	17
15	Dinwiddie	6	3	9
36	Franklin	4	12	16
6	Greenville	1	1	2
33	Halifax	12	5	17
21	Henry	3	3	6
23	Lunenburgh	5	4	9
26	Mecklenburgh	7	3	10
7	Nottoway	1	4	5
22	Patrick	1	7	8
41	Pittsylvania	9	7	16
7	Prince Edward	1	2	3
276		61	64	125
	SOUTHWESTERN COUNTIES (17).			
9	Bland	1	5	6
11	Buchanan		5	5
19	Carroll	1	8	9
22	Floyd	2	7	9
14	Giles		6	6
24	Grayson	2	13	15
23	Lee		12	12
17	Montgomery	1	3	4
9	Pulaski		6	6
10	Roanoke	2	3	5
22	Russell		12	12
19	Scott		9	9
20	Smyth	1	8	9
20	Tazewell		9	9
26	Washington	1	14	15
13	Wise	1	4	5
12	Wythe		4	4
292		12	128	140
	WESTERN COUNTIES (7).			
14	Alleghany	1	2	3
44	Augusta	7	16	23
12	Bath		6	6
22	Botetourt	4	5	9
9	Craig	1	4	5
13	Highland		6	6
20	Rockbridge	3	7	10
142		16	46	62
	RECAPITULATION.			
372	Central counties	73	89	162
312	Northern counties	68	92	160
198	Eastern counties	110	15	125
93	Southeastern counties	37	18	55
276	Southern counties	61	64	125
292	Southwestern counties	12	128	140
142	Western counties	16	46	62
1,685		377	452	829

8. MAINE.

	CENTRAL COUNTIES (2).			
112	Penobscot	20	48	68
32	Piscataquis	3	20	23
144		23	68	91
	NORTHEASTERN COUNTIES (1).			
64	Aroostook	1	30	31

8. MAINE—Continued.

Offices interrogated.	Counties.	Number of replies.		
		Yes.	No.	Total.
	EASTERN COUNTIES (1).			
58	Washington	31	10	41
	SOUTHERN COUNTIES (4).			
80	Hancock	46	13	59
33	Knox	7	15	22
42	Lincoln	21	8	29
58	Waldo	23	19	42
213		97	55	152
	SOUTHWESTERN COUNTIES (6).			
48	Androscoggin	9	23	32
80	Cumberland	42	12	54
65	Kennebec	14	23	37
76	Oxford	14	31	45
17	Sagadahoc	9	1	10
70	York	20	24	44
356		108	114	222
	WESTERN COUNTIES (2).			
33	Franklin	7	12	19
57	Somerset	7	28	35
90		14	40	54
	RECAPITULATION.			
144	Central counties	23	68	91
64	Northeastern counties	1	30	31
58	Eastern counties	31	10	41
213	Southern counties	97	55	152
356	Southwestern counties	108	114	222
90	Western counties	14	40	54
925		274	317	591

9. GEORGIA.

	CENTRAL COUNTIES (23).			
4	Baldwin		1	1
5	Bibb	2	1	3
6	Butts	1	1	2
5	Crawford	2		2
7	Dodge	3		3
7	Greene	2	2	4
7	Hancock	3	2	5
7	Houston	5	2	7
10	Jasper	3	2	5
4	Johnson	1	1	2
12	Jones	4	1	5
8	Laurens	2	2	4
11	Monroe	4	2	6
7	Montgomery		2	2
4	Morgan	1	2	3
5	Newton	1	2	3
4	Pulaski		1	1
2	Putnam	1		1
2	Rockdale		1	1
2	Taliaferro		2	2
9	Twiggs	3	1	4
8	Washington	3	3	4
7	Wilkinson	1	3	4
143		41	33	74

9. GEORGIA—Continued.

Offices interrogated.	Counties.	Number of replies.		
		Yes.	No.	Total.
	NORTHERN COUNTIES (19).			
16	Cherokee	3	3	6
2	Clarke	1		1
10	Cobb	4	2	6
10	Dawson	2	5	7
10	De Kalb	2	3	5
9	Fannin		6	6
9	Forsyth	2	3	5
8	Fulton	5	2	7
7	Gilmer		5	5
14	Gwinnett	2	2	4
15	Hall	3	3	6
16	Jackson	4	1	5
5	Lumpkin		1	1
4	Milton	1		1
3	Oconee		1	1
3	Towns		2	2
8	Union	1	4	5
8	Walton	2		2
7	White	1	5	6
164		33	48	81
	NORTHEASTERN COUNTIES (10).			
11	Banks	3	3	6
18	Elbert	1	6	7
16	Franklin	4	2	6
8	Habersham	2	5	7
11	Hart	3	2	5
5	Lincoln		3	3
4	Madison	2		2
9	Oglethorpe	2	2	4
6	Rabun		2	2
3	Wilkes		1	1
91		17	26	43
	EASTERN COUNTIES (11).			
6	Bulloch	2	1	3
14	Burke	4	3	7
9	Columbia	3	1	4
6	Effingham	1	3	4
7	Emanuel		1	1
1	Glascock		1	1
5	Jefferson		1	1
3	McDuffie	1		1
7	Richmond		4	4
19	Screven	4	6	10
6	Warren	1		1
83		16	21	37
	SOUTHEASTERN COUNTIES (12).			
7	Appling	4		4
4	Bryan	2		2
5	Camden	1	1	2
2	Charlton	0		0
2	Chatham	1	1	2
7	Glynn		5	5
8	Liberty	3	5	8
3	McIntosh	1	1	2
5	Pierce	1	2	3
8	Tattnall	3	1	4
7	Ware	1	2	3
11	Wayne	2	5	7
69		19	23	42
	SOUTHERN COUNTIES (13).			
11	Berrien		4	4
6	Brooks		3	3
5	Linch	1	2	3
8	Coffee	4	1	5

9. GEORGIA—Continued.

Offices interrogated.	Counties.	Number of replies.		
		Yes.	No.	Total.
	SOUTHERN COUNTIES—Continued.			
6	Colquitt	1	3	4
9	Dooly	1	2	3
3	Echols		1	1
5	Irwin	1	1	2
9	Lowndes	3	2	5
8	Pickens		3	3
12	Telfair	1	4	5
5	Wilcox	2	2	4
9	Worth	3	2	5
96		17	29	46
	SOUTHWESTERN COUNTIES (16).			
3	Baker		2	2
6	Calhoun	1		1
2	Clay			
7	Decatur	4	1	5
6	Dougherty			
4	Early			
5	Lee		3	3
3	Miller	3		3
3	Mitchell		3	2
3	Quitman	1		1
3	Randolph	1	2	3
7	Stewart	3		3
6	Sumter	1		1
2	Terrell		2	2
7	Thomas		3	3
1	Webster	0	0	0
68		14	15	29
	WESTERN COUNTIES (21).			
6	Campbell	1	3	4
17	Carroll	6	1	7
5	Chattahoochee		2	2
10	Coweta	3		3
7	Douglas		1	1
4	Fayette	1	1	2
8	Haralson	1	2	3
12	Harris	1	1	2
10	Heard	2	3	5
9	Henry	3		3
7	Macon	1	1	2
6	Marion		2	2
14	Meriwether	5	3	8
2	Muscogee		1	1
10	Pike	3		3
5	Schley	4	1	5
4	Spalding	1	2	3
7	Talbot	2	1	3
4	Taylor		2	2
11	Troup	1	3	4
6	Upson	3	2	5
164		38	32	70
	NORTHWESTERN COUNTIES (12).			
15	Bartow	2	4	6
5	Catoosa	1	2	3
13	Chattooga	3	2	5
4	Clayton	3		3
7	Dade		4	4
15	Floyd	5	2	7
14	Gordon	3	5	8
9	Murray	1	2	3
8	Paulding	2	3	5
5	Polk	2		2
17	Walker	2	3	5
14	Whitfield	3	6	9
126		27	33	60

9. GEORGIA—Continued.

Offices interrogated.	Counties.	Number of replies.		
		Yes.	No.	Total.
	RECAPITULATION.			
143	Central counties	41	33	74
164	Northern counties	33	48	81
91	Northeastern counties	17	26	43
83	Eastern counties	10	21	37
69	Southeastern counties	19	23	42
96	Southern counties	17	29	46
68	Southwestern counties	14	15	29
164	Western counties	38	32	70
126	Northwestern counties	27	33	60
1,004		222	260	483

10. SOUTH CAROLINA.

	CENTRAL COUNTIES (5).			
12	Clarendon	1	4	5
22	Lexington	3	3	6
16	Orangeburgh	3	4	7
9	Richland	2	2	4
15	Sumter	3	3	6
74		12	16	28
	NORTHERN COUNTIES (6).			
14	Chester	1	4	5
14	Fairfield	2	6	8
9	Kershaw	1	1	2
16	Lancaster	4	1	5
21	Union	6	3	9
23	York	3	4	7
97		17	19	36
	NORTHEASTERN COUNTIES (5).			
13	Chesterfield		6	6
14	Darlington	3	5	8
11	Horry	3	2	5
27	Marion	8	7	15
8	Marlborough	2		2
73		16	20	36
	EASTERN COUNTIES (3).			
19	Charleston	5	5	10
6	Georgetown		2	2
16	Williamsburgh	4	4	8
41		9	11	20
	SOUTHERN COUNTIES (4).			
20	Barnwell	3	8	11
12	Beaufort	1	4	5
25	Colleton	6	8	14
12	Hampton	4	3	7
69		14	23	37
	WESTERN COUNTIES (4).			
27	Abbeville	7	7	14
22	Aiken	5	5	10
40	Edgefield	9	9	18
14	Newberry	6	4	10
103		27	25	52

10. SOUTH CAROLINA—Continued.

Offices interrogated.	Counties.	Number of replies. Yes.	No.	Total.
	NORTHWESTERN COUNTIES (6).			
25	Anderson	10	2	12
34	Greenville	5	9	14
29	Laurens	6	6	12
21	Oconee	6	6	12
15	Pickens	2	6	8
36	Spartanburgh	12	7	19
160		41	36	77
	RECAPITULATION.			
74	Central counties	12	16	28
97	Northern counties	17	19	36
73	Northeastern counties	16	20	36
41	Eastern counties	9	11	20
69	Southern counties	14	23	37
103	Western counties	27	25	52
160	Northwestern counties	41	36	77
617		136	150	286

11. MARYLAND.

	CENTRAL COUNTIES (4).			
33	Anne Arundel	8	7	15
27	Howard	2	10	12
44	Montgomery	9	7	16
41	Prince George's	4	11	15
145		23	35	58
	NORTHERN COUNTIES (3).			
86	Baltimore	23	21	44
48	Carroll	5	18	23
46	Harford	9	11	20
188		37	50	87
	EASTERN COUNTIES (3).			
21	Caroline	7	6	13
11	Queen Anne	2	3	5
17	Talbot	5	4	9
49		14	13	27
	NORTHEASTERN COUNTIES (2).			
28	Cecil	12	6	18
18	Kent	3	8	11
46		15	14	29
	SOUTHEASTERN COUNTIES (4).			
29	Dorchester	17	.....	17
14	Somerset	8	2	10
13	Wicomico	8	.....	8
14	Worcester	7	1	8
70		40	3	43
	SOUTHERN COUNTIES (3).			
18	Calvert	6	4	10
25	Charles	8	4	12
25	St. Mary's	10	2	12
68		24	10	34

11. MARYLAND—Continued.

Offices interrogated.	Counties.	Number of replies.		
		Yes.	No.	Total.
	NORTHWESTERN COUNTIES (4).			
16	Alleghany		11	11
59	Frederick	13	16	29
16	Garrett	1	5	6
34	Washington	5	15	20
125		19	47	66
	RECAPITULATION.			
145	Central counties	23	35	58
180	Northern counties	37	50	87
49	Eastern counties	14	13	27
46	Northeastern counties	15	14	29
70	Southeastern counties	40	3	43
68	Southern counties	24	10	34
125	Northwestern counties	19	47	66
683		172	172	344

12. FLORIDA.

	CENTRAL COUNTIES (7).			
8	Hernando	4	2	6
13	Hillsborough	6	3	9
7	Levy	2	2	4
15	Marion	3	6	9
32	Orange	16	5	21
3	Polk		1	1
9	Sumter	4	4	8
87		35	23	58
	NORTHERN COUNTIES (12).			
17	Alachua	8	3	11
3	Baker	1	1	2
7	Bradford		1	1
10	Columbia	1	4	5
7	Hamilton		2	2
6	Jefferson	2	2	4
7	La Fayette		4	4
5	Leon	1	2	3
4	Madison		2	2
12	Suwannee	1	7	8
7	Taylor	1	3	4
7	Wakulla		2	2
92		15	33	48
	NORTHEASTERN COUNTIES (5).			
7	Clay	3	3	6
10	Duval	6	2	8
12	Nassau	2	3	5
22	Putnam	13	4	17
9	St. John's	2	2	4
60		26	14	40
	EASTERN COUNTIES (2).			
6	Brevard	3	3	6
17	Volusia	10	1	11
23		13	4	17
	SOUTHEASTERN COUNTIES (1).			
2	Dade			

12. FLORIDA—Continued.

Offices interrogated.	Counties.	Number of replies. Yes.	No.	Total.
	SOUTHERN COUNTIES (2).			
9	Manatee	3	6	9
3	Monroe		2	2
12		3	8	11
	NORTHWESTERN COUNTIES (10).			
6	Calhoun	2	2	4
9	Escambia	2	5	7
4	Franklin	1	1	2
8	Gadsden	4	2	6
3	Holmes		1	1
7	Jackson	2	1	3
4	Liberty		3	3
5	Santa Rosa		3	3
6	Walton	2	1	3
7	Washington	1	2	3
59		14	21	35
	RECAPITULATION.			
87	Central counties	35	23	58
92	Northern counties	15	33	48
60	Northeastern counties	26	14	40
23	Eastern counties	13	4	17
2	Southeastern counties			
12	Southern counties	3	8	11
59	Northwestern counties	14	21	35
335		106	103	209

13. NEW JERSEY.

	CENTRAL COUNTIES (6).			
54	Burlington	34	3	37
20	Mercer	9	4	13
25	Middlesex	15	7	22
61	Monmouth	36	9	45
27	Ocean	20	2	22
34	Somerset	5	17	22
221		119	42	161
	NORTHERN COUNTIES (3).			
58	Morris	13	24	37
22	Passaic	3	6	9
41	Sussex	2	26	28
121		18	56	74
	NORTHEASTERN COUNTIES (4).			
46	Bergen	7	12	19
21	Essex	4	9	13
16	Hudson	3	4	7
14	Union	1	8	9
97		15	33	48
	SOUTHERN COUNTIES (2).			
21	Atlantic	16		16
20	Cape May	17		17
41		33		33
	SOUTHWESTERN COUNTIES (4).			
19	Camden	12		12
29	Cumberland	15	5	20
21	Salem	6	2	8
36	Gloucester	19	3	22
105		52	10	62

13. NEW JERSEY—Continued.

Offices interrogated.	Counties.	Number of replies.		
		Yes.	No.	Total.
	NORTHWESTERN COUNTIES (2).			
56	Hunterdon	16	16	32
45	Warren	6	30	36
101		22	46	68
	RECAPITULATION.			
221	Central counties	119	42	161
121	Northern counties	18	56	74
97	Northeastern counties	15	33	48
41	Southern counties	33		33
105	Southwestern counties	52	10	62
101	Northwestern counties	22	46	68
686		259	187	446

14. MASSACHUSETTS.

	CENTRAL COUNTIES (1).			
122	Worcester	35	56	91
	NORTHEASTERN COUNTIES (1).			
65	Essex	29	13	42
	EASTERN COUNTIES (3).			
112	Middlesex	47	29	76
62	Norfolk	15	23	38
17	Suffolk	4	2	6
191		66	54	120
	SOUTHEASTERN COUNTIES (5).			
62	Barnstable	35	11	46
46	Bristol	28	4	32
7	Dukes	4	2	6
1	Nantucket		1	1
70	Plymouth	28	16	44
186		95	34	129
	SOUTHWESTERN COUNTIES (1).			
43	Hampden	20	5	25
	WESTERN COUNTIES (2).			
62	Berkshire	14	24	38
45	Hampshire	19	12	31
107		33	36	69
	NORTHWESTERN COUNTIES (1).			
54	Franklin	30	11	41
	RECAPITULATION.			
122	Central counties	35	56	91
65	Northeastern counties	29	13	42
191	Eastern counties	66	54	120
186	Southeastern counties	95	34	129
43	Southwestern counties	20	5	25
107	Western counties	33	36	69
54	Northwestern counties	30	11	41
768		308	209	517

15. DELAWARE.

Offices interrogated.	Counties.	Number of replies. Yes.	No.	Total.
	CENTRAL COUNTIES (1).			
30	Kent	14	4	18
	NORTHERN COUNTIES (1).			
44	New Castle	10	8	18
	SOUTHERN COUNTIES (1).			
33	Sussex	15	5	20
	RECAPITULATION.			
30	Central counties	14	4	18
44	Northern counties	10	8	18
33	Southern counties	15	5	20
107		39	17	56

16. CONNECTICUT.

	NORTHERN COUNTIES (2).			
76	Hartford	47	6	53
36	Tolland	18	3	21
112		65	9	74
	NORTHEASTERN COUNTIES (1).			
56	Windham	18	14	32
	SOUTHEASTERN COUNTIES (1).			
50	New London	35	4	39
	SOUTHERN COUNTIES (2).			
30	Middlesex	19		19
58	New Haven	37		37
88		56		56
	SOUTHWESTERN COUNTIES (1).			
66	Fairfield	29	15	44
	NORTHWESTERN COUNTIES (1).			
82	Litchfield	27	21	48
	RECAPITULATION.			
112	Northern counties	65	9	74
56	Northeastern counties	18	14	32
50	Southeastern counties	35	4	39
88	Southern counties	56		56
66	Southwestern counties	29	15	44
82	Northwestern counties	27	21	48
454		230	63	293

17. RHODE ISLAND.

	CENTRAL COUNTIES (1).			
18	Kent	8	4	12
	NORTHERN COUNTIES (1).			
43	Providence	30	5	35

17. RHODE ISLAND—Continued.

Offices interrogated.	Counties.	Number of replies.		
		Yes.	No.	Total.
	EASTERN COUNTIES (1).			
6	Bristol	3		3
	SOUTHEASTERN COUNTIES (1).			
9	Newport	5		5
	SOUTHERN COUNTIES (1).			
34	Washington	24	2	26
	RECAPITULATION.			
18	Central counties	8	4	12
43	Northern counties	30	5	35
6	Eastern counties	3		3
9	Southeastern counties	5		5
34	Southern counties	24	2	26
110		70	11	81

Recapitulation of the seventeen States that use fish guano.

Offices interrogated.	States.	Number of replies.			Per cent. of affirmative replies.
		Yes.	No.	Total.	
3,381	1. Pennsylvania	305	1,426	1,731	18
2,930	2. New York	375	1,183	1,558	24
456	3. New Hampshire	91	208	299	30
1,395	4. North Carolina	223	477	700	32
497	5. Vermont	105	210	315	33
1,091	6. Alabama	175	329	504	36
1,685	7. Virginia	377	452	829	45
925	8. Maine	274	317	591	46
1,004	9. Georgia	222	260	482	46
617	10. South Carolina	136	150	286	48
683	11. Maryland	172	172	344	50
335	12. Florida	106	103	209	51
686	13. New Jersey	259	187	446	58
768	14. Massachusetts	308	209	517	60
107	15. Delaware	39	17	56	69
454	16. Connecticut	230	63	293	79
110	17. Rhode Island	70	11	81	86
17,124		3,467	5,774	9,241	

SPECIAL AFFIRMATIVE STATEMENTS FROM DELAWARE.

For the purpose of testing the matter further in a State largely reported as using this fertilizer, special questions were sent out, in answer to which the statements quoted below were obtained. Time prevented prosecuting the inquiry in other States.

"The fish guano used here is obtained out of town, and amounts to very little." J. M. Martin, Cool Spring, Sussex County.

"Mr. J. F. Price and about four others use 30 tons annually, which they obtain in Baltimore." P. B. Alrich, Summit Bridge, New Castle County.

"The small amount used has been obtained from W. N. Needles, 42 South Delaware avenue, Philadelphia." William G. Herring, P. M., Milford, Kent County.

"Only used here in small quantities and obtained from Philadelphia mostly." J. A. Lynch, P. M., Robbins, Sussex County.

"Several thousand tons are used in this region by hundreds of farmers and truckers who sell vegetables in the city. Nearly all dealers in fertilizers in Pennsylvania and New Jersey sell it. They buy it from ourselves and others who prepare it. It is made on the coasts of Long Island, Connecticut, and Maine. It is shipped to us in bulk, by vessels, after which we grind and bag it." Walton, Ham & Co., Wilmington, Del.

"About one hundred tons are being used by forty farmers, among whom are W. Phillips & Bro., Phillips Hill, Del., G. P. Hickman and J. Single, Frankford, Del. Wilgus, Derickson & Co., Roxana, Del., and Gum & Bro., Frankford, Del., are dealers who buy it from a manufactory at Fenwick's Island, near Roxana, Del." J. T. Long, P. M., Frankford, Del.

"Fish guano is not much used. The farmers buy spoiled salt fish in Philadelphia, and manufacture it for their own use to some extent." L. W. Lattomus, Townsend, New Castle County.

"One hundred and fifty tons are used by seventy-five farmers, among whom are Spencer A. Phillips, Millsborough, Del., John Wilgus, Roxana, Del., and Horace Hickman, Frankford, Del. Holland, Wilgus & Co., E. Townsend, and John A. Gum are dealers, who buy mostly at Fenwick's Island, Del." J. E. Lynch, Roxana, Sussex County.

"There are two or three seines between Indian River and Fenwick's Island light-house that are hauled for fish to be used as fertilizer. Henry Hudson and William S. Evans have built a house for making the fish into guano, but the farmers here are so anxious for the fish that they go to the beach and buy them for manure before there is time to make them into guano. The fish we call 'old wives.' They are called moss bunkers, North. I have used them on my land and they are better than any guano I ever had." P. M., Ocean View, Sussex County.

"I used half a ton on strawberries last fall. It was made by the New Jersey Chemical Company, Camden, N. J., from alewives or mud shad, which are caught on the New Jersey shore." John T. Jakes, Wyoming, Kent County.

"It has been used on three farms, especially by Alexander Guthrie. It is brought from Wilmington." Jasper C. Way, P. M., Hockessin, New Castle County.

"Five tons are used annually by Thos. E. Woolens, George B. Dougherty, and seven or eight other farmers. They buy it from J. J. Allen's Sons, Philadelphia, Pa., and from John A. Wilson, Wilmington, Del." Charles Green, jr., Rockland, New Castle County.

"J. M. Arthurs and W. D. Wilds, Kenton, Del., sell to a few farmers here." J. B. Messick, Down's Chapel, Kent County.

"H. A. Murray, Dover, Del., formerly made it, but has engaged in other business. Those who formerly used fish guano here have discontinued it, finding by experience that other fertilizers were preferable." Julia S. Bradley, P. M., Canterbury, Kent County.

"Four or five tons are used by from five to ten persons, among whom are E. D. Hitchens and H. Hickman. T. E. Records and E. D. Hitchens deal in it, and buy it in Philadelphia and New York." D. W. Brereton, P. M., Lewes, Sussex County.

FERTILIZING PRODUCTS.

The following statement is by Mr. A. M. Wilcox, secretary of the Fish Bureau, Boston, Mass.: "During the past few years more attention has each year been given to the fertilizing qualities contained in the large amount of fish waste and scrap that was formerly constantly being thrown away. Three of the numerous factories in and around Boston use any fish products, making a specialty of this line, utilizing all the scrap and waste from the numerous boneless fish factories, menhaden chum, and the large amount of refuse from the market fishermen, such as fish heads, all kinds of unmarketable fish, in fact everything connected with the fish that was formerly thrown away is now utilized at the fertilizing factory, the fishermen receiving quite a sum for the same.

"The process of manufacture is simple and varies but little in any of the factories, fish scrap, bone phosphate, and sulphuric acid being the main ingredients used by all. The use of this fertilizing material has shown such favorable results, the demand is constantly on the increase. Dealers give the following as the distribution from the various factories of New England during 1879:

	Tons.
New York	40,000
North Carolina	20,000
South Carolina	20,000
Virginia	45,000
Georgia	45,000
New England	10,000

"Maryland and New Jersey take a less amount. The newer States of the West as yet care for but little if any fertilizing compounds. A large amount is also exported to the West Indies. Fourteen thousand tons were manufactured by the three factories here during 1879. The price ranged from $25 to $35 a ton."

The *proportional* part of the capital and products to the credit of the fishing industry is as follows:

Capital	$100,000
Men employed	90
Value of product	$140,000

APPENDIX C.

NATURAL HISTORY AND BIOLOGICAL RESEARCH.

X.—THE ANNELIDA CHÆTOPODA FROM PROVINCETOWN AND WELLFLEET, MASS.

By Prof. H. E. Webster and James E. Benedict.

The annelids on which this paper is based were collected from June to September, 1879, by the Summer Zoological Expedition of Union College. Of the 90 species found, by far the greater number live between tides. Not much dredging was done, and none at a greater depth than thirty fathoms. Two visits to Wellfleet procured a number of forms not found at Provincetown. Three genera and sixteen species are described as new. Of the genera, *Thaumastoma* seems not to belong to any described family. Eighteen species have their northern limit extended, having been previously found only to the south of the Cape. *Nerilla antennata* Schmidt and *Trichobranchus glacialis* Malmgren are European forms not previously found on our coast. *Syllides* Œrsted is also new to our coast, and is represented by a new species. *Capitella capitata* has not previously been reported from the United States, though found further north. The figures, except figs. 95—97, were made by H. E. Webster.

Family APHRODITIDÆ.

APHRODITA (*Linn.*) *Kinberg.*

Aphrodita aculeata *Linn.*

Aphrodita aculeata Linn. Systema Naturæ, ed. xii, vol. i, p. 1084. 1767.
Kinberg. Eugenies Resa, p. 3, pl. i, fig. 2. 1857.
Selenka. Das Gefässsystem der Aphrodita aculeata, ex Niederländisches Archiv für Zoologie, pls. iii–iv. 1873.
Verrill. Invertebrate animals of Vineyard Sound, in Report of U. S. Commissioner of Fish and Fisheries, Part i, p. 580. 1874.

No large specimens were taken; 20 to 28 fathoms, sand and shells.

Family POLYNOIDÆ.

LEPIDONOTUS (*Leach*) *Kinberg.*

Lepidonotus squamatus *Kinberg.*

Lepidonote armadillo Leidy. Marine Invert. Fauna, R. I. and N. J., Ex. Jour. Phila. Acad., series ii, vol. iii, p. 16, pl. xi, fig. 54. 1855.
Lepidonotus squamatus Knbg. Fregatten Eugenies Resa. Zoologi, Annulata, p. 13, pl. xv, fig. 15. 1857.

Lepidonotus squamatus VERRILL. Invert. Animals of Vineyard Sound, etc., p. 581. 1874.
WEBSTER. Annelida Chætopoda of the Virginian Coast, in Trans. Albany Institute, vol. ix, p. 204, pl. i, figs. 1–5. 1879.
Annelida Chætopoda of New Jersey, in the Thirty-second report of the N. Y. State Museum, p. 101. 1880.

Specimens not large but abundant from low water to 29 fathoms.

NYCHIA *Malmgren.*

NYCHIA CIRROSA *Malmgren.*

Aphrodita cirrhosa PALLAS. Miscell. Zoöl., p. 95, pl. viii, figs. 3–6 (*teste Malmgren*). 1766.
Lepidonote assimilis ÖRSTED. Annulatorum Danicorum Conspectus, p. 13, figs. 3, 6, 14, 32, 33, 37, 38, 45, 46. 1843.
Nychia cirrosa MALMGREN. Nordiska Hafs-Annulater, p. 58, pl. viii, fig. 1. 1865.

The foot of this species is not correctly figured by Malmgren. The upper ramus is not shown in the figure (l. c. fig. 1 B), but the lower ramus is represented as bluntly rounded externally. In fact the outline of the foot is very nearly that of *Eunoë Örstedi* MGM. (l. c. pl. viii, fig. 3 B). The lower margin of the upper ramus and the upper margin of the lower ramus are drawn out into conical, finger-shaped projections.

Not common; 29 fathoms, sand and shells.

NYCHIA AMONDSENI *Malmgren.*

MALMGREN. *Annulata Polychæta*, p. 131, pl. ii, fig. 4. 1867.

The same defect exists in Malmgren's figure of the foot of this species (l. c. fig. 4 B) as in the previous species.

Only one specimen was taken. Sand and shells, 29 fathoms.

EUNOA *Malmgren.*

EUNOA NODOSA *Malmgren.*

Polynoë nodosa SARS. Christiana Vid. Selsk. Forh., p. 59, 1860.
Eunoë nodosa MALMGREN. Nord. Hafs-Anu., p. 64, pl. viii, fig. 4. 1865.
Eunoa nodosa MALMGREN. Annu. Polych., p. 132. 1867.

Only half-grown specimens of this species were found. They differ in some particulars from Malmgren's description. The elytra are less distinctly emarginate and not so nodose. However, there can be no doubt as to their specific identity.

Not common; 12 to 30 fathoms, sand and shells.

LAGISCA *Malmgren.*

LAGISCA RARISPINA *Malmgren.*

Nordiska Hafs-Annulater, p. 65, pl. viii, fig. 2. 1865.

Common; 12 to 30 fathoms, sand and shells.

HARMOTHOË (*Kinberg*) *Malmgren.*

HARMOTHOË IMBRICATA *Malmgren.*

MALMGREN. Nordiska Hafs-Annulater, p. 66, pl. ix, fig. 8. 1865. Annulata Polychæta, p. 134. 1867.
VERRILL. Invertebrate Animals of Vineyard Sound, etc., p. 582. 1874.

Common, from low water to 30 fathoms.

LEPIDAMETRIA *Webster.*

LEPIDAMETRIA COMMENSALIS *Webster.*

Annel. Chæt. of the Virginian Coast, p. 210, pl. iii, figs. 23–31. 1779.
Annel. Chæt. of New Jersey, etc., p. 103. 1879.

At Wellfleet we found *Amphitrite ornata* VERRILL quite common in coarse gravel and mud. As usual, *L. commensalis* occurred in the tubes of this species, but sparingly. Most of the specimens taken were young, from one-half inch to one inch in length. In these the stout, single-pointed setæ of the upper bundle, lower ramus, had not yet appeared; the attachments of the elytra were very prominent; otherwise they did not differ from the adult form.

Family SIGALIONIDÆ.

SIGALION *Aud. and M. Ed.*

SIGALION ARENICOLA *Verrill.*

Proceedings of the United States National Museum, p. 167. Nov., 1869.

This species has a close superficial resemblance to *Sthenelais picta* VERRILL, and occupies the same stations.

Not common. Sand; low water.

STHENELAIS *Kinberg.*

STHENELAIS PICTA *Verrill.*

VERRILL. Invert. Animal of Vin. Snd., etc., p. 582. 1874.
WEBSTER. Annel. Chæt. of the Virginia Coast, p. 213. 1879. Annel. Chæt. of New Jersey, p. 103. 1880.

Common at low water, in sand.

PHOLOË *Johnston.*

PHOLOË MINUTA *Malmgren.*

Aphrodita minuta O. FAB. Fauna Grönlandica, p. 314. 1780.
Pholoë minuta MALMGREN. Nordiska Hafs.—Ann., p. 89, pl. xi, fig. 13. 1865.
? Pholoë tecta STIMPSON. Marine Invertebrata of Grand Manan, p. 36. 1854.

Only young specimens were found. They agreed in all respects with *Pholoë minuta*, save that the elytra completely covered the dorsum.

This is also the case with Stimpson's *Pholoë tecta*. It is probable that *Pholoë tecta** is the young of *Pholoë minuta*.

Not common; low water; sand.

Family NEPHTHYDIDÆ.

NEPHTHYS *Cuvier*.

NEPHTHYS INCISA *Malmgren*.

Nephthys incisa MGRN. Nordiska Hafs.—Ann., p. 105, pl. xii, fig. 21. 1865.
Nephthys ingens VERRILL. Invert. Ann. of Vin. Snd., etc., pl. 583, pl. xii, figs. 59, 60. 1874.
Nephthys incisa VERRILL. Check-List. 1879.

Common; 12 to 20 fathoms; mud.

NEPHTHYS BUCERA *Ehlers*.

EHLERS. Die Borstenwürmer, p. 617, pl. xxiii, fig. 8. 1868.
VERRILL. Invert. Animals of Vin. Snd., p. 583, pl. xii, fig. 58. 1874.

Not common; found in sand at low water. Very fine specimens were taken at Race Run, near Provincetown.

Family PHYLLODOCIDÆ.

ANAITIS *Malmgren*.

ANAITIS SPECIOSA *Webster*.

Annel. Chæt. of New Jersey, p. 104, pl. i, figs. 8, 9. 1880.

When first examined we regarded the specimens collected at Wellfleet as distinct from *Anaitis speciosa;* subsequent comparison of specimens has shown that the former must be regarded as a variety of the latter. As compared with specimens from New Jersey, these have the head a little narrower; the anterior emargination of the buccal segment, with the corresponding backward curvature of the posterior margin of the head, not so well marked.

The color is variable. In front of the eighth segment the color is yellowish-white; a dark-brown band covers the eighth segment and the anterior half of the ninth; behind this band the color is yellow or brownish-yellow; the middle third of the anterior margin of each segment is brown, while on the posterior segments this brown band runs entirely across the segment; the branchiæ for their inner two-thirds are yellowish-brown, outer third white; the brown band of the eighth and ninth segments includes the branchiæ, and is faintly perceptible below; body and branchiæ with numerous flake-white specks; head white with brown specks; or the general color may be white, green replacing the

* Examination of many specimens at Eastport, Me., has fully established the identity of *P. tecta* with *P. minuta*.

brown everywhere; the general color of the ventrum is the same as on the dorsum, though the brown or green is not so distinct.

Wellfleet; low water; on tubes of *Diopatra cuprea* CLPD.

PHYLLODOCE (*Sav.*) *Malmgren.*

PHYLLODOCE GRŒNLANDICA *Örsted.*

No adult specimens of this remarkably fine species were collected. A number of half-grown specimens were taken.

A minute, nearly spherical median papilla was seen in fresh specimens on the anterior projecting margin of the buccal segment; not visible on alcoholic specimens.

The transverse ridge between the segments is densely ciliated, and a line of long cilia runs down the outer face of the branchiæ near the posterior margin.

General color, dark green, with irregular brown markings; branchiæ brown, with light-green margin.

The anal cirri are about the length of the last five segments.

Low water, sand, to 25 fathoms, sand and shells.

PHYLLODOCE ARENÆ *Webster.*

Annel. Chæt. of New Jersey, p. 105, pl. ii, figs. 10–12. 1880.

Low water, sand, to 25 fathoms, sand and shells.

EUMIDA *Malmgren.*

EUMIDA MACULOSA *Webster.*

Annel. Chæt. of the Virginian coast, p. 215, pl. iv, figs. 38, 41, 1879. Annel. Chæt. of New Jersey, p. 106, 1880.

In the original description the anal cirri are said to arise from "stout basal articles, constituting one-third their entire length." This is a mistake; they have no basal article. Only two specimens were taken in Virginia, and but one of these had anal cirri, and these seem not to have been normal. Near the front of the head there is a slight constriction.

Low water, sand, common.

EULALIA (*Sav.*) *Malmgren.*

EULALIA GRACILIS *Verrill.*

Invert. Animals of Vineyard Sound, etc., p. 586. 1874.

Probably *gracilis;* though, as no figures accompany the original description, one can hardly be certain without comparison with the typical examples.

Both males and females have very long and delicate capillary setæ developed in addition to the ordinary setæ, not, as in the SYLLIDÆ,

as a distinct bundle, but mixed with the ordinary setæ. They begin from the twenty-fifth to the thirtieth segment, short at first, but soon becoming as long or longer than the width of the body, while the ordinary setæ are quite short; they extend nearly to the posterior end. In the males the posterior two-thirds of the body is rounded, much swollen by the contained spermatozoa. After the twenty-fifth segment the body of the females is filled with numerous large eggs; these are very dark green, and determine the color of the body wherever they exist. The anterior part of the body has the same color as in the males and in asexual forms. This is gray, with lateral brown bands, one on each side, and with a darker brown spot at the base of each foot, both above and below.

There are three anal cirri on all forms, the odd one being median, ventral, and quite small.

Common on dredged shells, 20 to 30 fathoms; sand and shells.

EULALIA DUBIA *n. sp.*

(PL. VIII, FIGS. 101–105.)

This species we at first referred to *Eulalia annulata* VERRILL, but when the specimens were submitted to him he decided that they did not belong to his species.

The head (fig. 101) has the lateral margins evenly rounded, with a constriction just back of the origin of the antennæ. The inferior antennæ are concealed by the superior, but are similar to them in every respect. The median antenna is a trifle less stout than the anterior, otherwise the same. Eyes two, moderately large, circular, black.

Tentacular cirrus of the first segment and the lower cirrus of the second segment equal in length; about one-half as long as the other cirri; these reach about to the fourth setigerous segment.

The branchiæ are all acute, growing progressively longer and wider from the first segment (fig. 102) to the middle of the body (fig. 103), after which they continue to increase in length, but diminish in breadth, becoming very long and narrow on the posterior segments (fig. 104). The ventral cirri undergo similar changes, but not to the same extent. The segments of the posterior half of the body are crossed by a narrow raised band.

The setæ have very short terminal articles (fig. 105); the stem terminates in a series of minute teeth, with one much larger slightly curved tooth The proboscis is long, cylindrical, densely covered with cylindrical papillæ. Segments, deeply incised.

Body, dark green; branchiæ, dark brown, with green margin; a dark brown spot at the base of the feet, both above and below.

The specimen from which the figure of the head was made had the head retracted, so that the first pair of tentacular cirri seem to originate beneath the head; in extended specimens the first segment is plainly

visible. Some specimens had four eyes; in this case they are all on the same straight line, the outer pair smaller than the inner.

The transverse band crossing the segments is densely ciliated, and there is a line of cilia on the posterior face of the branchiæ (after the first few segments), near the inner margin.

Common. Low water to 20 fathoms.

ETEONE (*Sav.*) *Örsted.*

ETEONE ALBA *Webster.*

Annelida Chætopoda of New Jersey, p. 106, pl. ii, figs. 13-16, 1880.

We found this species in New Jersey, associated with *Streblospio Benedicti* WEBSTER, for the most part in mussel beds, in about 15 feet of water. We found it at Wellfleet, associated with the same species, but near high-water mark, in firm mud.

Not common.

ETEONE CINEREA *n. sp.*

(PL. I, FIGS. 1-5.)

Head convex above, flattened below, constricted just back of the origin of the superior antennæ, sides and anterior and posterior margin convex. (fig. 4.)

Antennæ stout, conical, white, one-third as long as the head.

Eyes two, minute, black, hardly perceptible in alcoholic specimens.

Buccal segment a little more than half as long as the head; from the middle of its anterior margin a small rounded papilla projects.

Tentacular cirri short; the lower a little longer than the upper, and with a sudden falling off in diameter at the outer third; inner two-thirds fusiform.

The dorsal cirri (branchiæ) have nearly the same shape throughout. On the anterior segments (fig. 1) not quite so large as on the middle segments, and closer to the foot; on the middle segments (fig. 2) remote from the foot; on the posterior segments (fig. 3) smaller even than the anterior, but not in contact with the foot; they are all thick, flattened, with nearly straight sides and bluntly rounded end. The ventral cirri are like the dorsal, but smaller.

The setæ are numerous, quite short; the stem (fig. 5) terminates in two sharp, elongated points; the appendix, three times as long as the stem, is wide at base, but narrows rapidly to a minute capillary termination.

Anal segment smooth, cylindrical, as long as the four segments preceding it, without cirri, they having probably been lost.

The anterior and posterior segments are crossed by a distinct impressed line; the middle segments by two lines. Along the middle third the segments are longer and wider than elsewhere; the body tapering

a little forwards, rapidly along the posterior third; the posterior segments are about one-third the length and width of the median. The general color is light-gray, with a few scattered brown specks; anal segment, light-green; antennæ and tentacular cirri, white.

Greatest width, 2mm. Length, 28mm.

Single specimen, dredged; 20 fathoms; sand and shells.

Family HESIONIDÆ.

PODARKE *Ehlers.*

PODARKE OBSCURA *Verrill.*

VERRILL. Invert. Animals of Vin. Sound, etc., p. 589, pl. xii, fig. 61, 1874.
WEBSTER. Annel. Chæt. of the Virgn. Coast, p. 216, 1899. Annel. Chæt. of New Jersey, p. 107, 1879.

Provincetown and Wellfleet. Not common. Low water; sand and mud.

PODARKE CÆCA *n. sp.*

(PL. I, FIGS. 6–8.)

We found a few specimens of *Podarke* differing much from *Podarke obscura* VERRILL; it may be found to be the young of some species.

The head (fig. 6) was evenly rounded in front and at the sides; nearly straight behind; length to width as two to three; slightly convex; no eyes; antennæ arising from nearly cylindrical basal articles; posterior unpaired antenna, arising near the posterior margin, not quite so long or so stout as the others; upper (anterior) pair close to each other, near the anterior margin of the head; length (without basal articles) about equal to the length of the head; lower pair arise from the under surface of the head, just outside the upper pair; a trifle more delicate than the latter.

The first segment encroaches laterally on the head, reaching about to the middle line; it is nearly as long at the sides as the following segment, elsewhere about one-half as long.

The tentacular cirri are six on each side, not at all crowded, a single pair from each of the first three segments; they have stout and rather long cylindrical basal articles; are very variable in length; taper uniformly to a bluntly rounded apex. The feet (fig. 7) are quite large, pointed externally, much swollen at base, owing to the origin of the basal portion of the dorsal cirri.

The dorsal cirri do not extend beyond the feet, are delicate, conical; base a little swollen.

Ventral cirri given off at about the outer fourth of the foot; extend about to the end of the foot.

The segments are deeply incised, much wider than long, slightly convex, both from side to side and from before backwards.

On our specimens there were no setæ in the dorsal rami; as they were not in good condition, it seems probable that these setæ had been lost, as is often the case in *Podarke obscura*. The ventral setæ have the usual form; one in each bundle is very long, both in stem and appendix, those above and below it proportionately shorter as they are more remote; from 4 to 8 in each bundle.

The general color is yellowish white, crossed above and below by many transverse bands, made up of irregularly shaped, yellowish-brown spots and specks.

Width, without feet, at ninth segment, 2mm.

Length of first 10 segments, 10mm.

No entire specimen was found.

Low water; sand.

HESIONE (*Savigny*) *Quartrefages*.

Hesione agilis *n. sp.*

(Pl. I, Figs. 9-11.)

The head of this species is very peculiar (fig. 6); anterior margin with a slight median convexity, otherwise straight; outer angles very broadly rounded; lateral margins concave; posterior margin very concave; posterior angles prolonged far backward, forming wide, obtusely rounded lappets.

The length of the head along the middle line is one-third the width of its anterior part, while the distance from the anterior to the posterior lateral angles is a little more than two-thirds the same length.

The posterior antennæ arise from rounded projections (basal articles), half way between the eyes and anterior margin of the head; they are conical, a little swollen at base, in length about double the length of the head along the line on which they stand; the anterior antennæ arise from the front margin of the head in front of and a trifle within the posterior antennæ; they have stout cylindrical basal articles, are conical, a little longer than the posterior pair.

There are two pairs of eyes, lateral; bright red; anterior pair oval, oblique, large; posterior pair a little within the anterior, in contact with them, more or less regularly crescentic.

The tentacular cirri have the form shown in the figure, but their length was not even approximately the same on any two specimens. The longest one figured would reach about to the fourth segment, but in some specimens one of the cirri reaches to the eighth or even to the tenth segment. Out of half a dozen specimens taken we could determine no law for the relative length of the cirri; nor could we even say whether, as a rule, the upper were longer or shorter than the lower.

It would seem that they are normally very long, from two to four times as long as figured, but readily lost and renewed. They have long

and stout cylindrical basal articles, and taper uniformly to a bluntly rounded apex. The feet, dorsal cirri, and setæ are all very long, and increase in length from the first segment to the middle of the body, and then as regularly decrease. The superior ramus (fig. 7) bears a dorsal cirrus, which is as long or even longer than its foot; and a bundle of very delicate capillary setæ, as long as the cirrus, and quite numerous; the ventral ramus is just below the dorsal and projects beyond it, forming nearly one-half of the foot; it ends in a minute conical cirrus, is obliquely truncated below, and bears on its lower posterior margin a conical ventral cirrus, which projects beyond the apex of the foot by about one-half its length. The ventral ramus has a fan of compound setæ (fig. 8) which decrease in length uniformly from the upper to the lower part of the fan; the appendix of these setæ is about one-third the length of the stem.

The anterior enlarged part of the digestive tract extends through the first four segments; it is nearly cylindrical, tapering somewhat along the posterior third; is finely but distinctly transversely striated; has a deep median dorsal longitudinal incision or depression of varying width. The transverse striæ can be seen passing to the bottom of this depression in front, but behind it seems to be carried completely through, giving two bluntly rounded posterior terminations to this organ. Back of this the intestine has a yellowish, granular appearance, and for six segments sends diverticula into the feet, one-third as long as the feet.

One, two, or three segments preceding the anal have rudimentary appendages. The anal segment is much like the others, bears two anal cirri, in all respects similar to the dorsal cirri. Body slightly convex above and below; colorless, except as colored by the contents of the digestive tract; tapering uniformly, but gradually, from the first segment to the last.

The largest specimen had 18 setigerous segments.

Length, 2.55^{mm}; width of middle segment, 0.25^{mm}; length of foot from middle segment, 0.36^{mm}.

Found near high-water mark in sandy-mud, Wellfleet, Mass.

The width was about the same in all the specimens, but in most a number of the posterior segments had been lost.

According to the diagnosis given by Ehlers (Borsten., p. 187), this species is a *Hesione*. Ehlers does not mention a definite number of tentacular cirri. Grube, in his Annulata Semperiana, speaking of *Fallacia* QUATREFAGES, which is established as a genus because it has four pairs of tentacular cirri on each side, says that this is also the case with *Hesione* SAVIGNY, as is plainly stated in the preliminary description of the genus, Système des Annelides, p. 9. Grube further claims that the figure of *Hesione splendida* (l. c., pl. iii, fig. 3) shows six tentacular cirri, and the basal joint of another, on each side, and remarks that the loss of tentacular cirri is common in this group.

Quatrefages has examined the specimen from which Savigny made

his description. He regards it as having but six pairs of tentacular cirri, and succeeds in complicating matters by saying that the cirri of the feet are retractile ("Pedes longiusculi, cirri retractiles"), whereas Savigny says that the tentacular cirri are retractile, a thing sufficiently hard to believe. Langerhans (Zeitschrift für Wissenschaftliche Zoölogie, p. 306, 1879) adopts Grube's view as to *Hesione* and *Fallacia*, and refers *Hesione Steenstrupii* QUATREFAGES to *Halimede* RATHKE; but *Halimede* is regarded by Malmgren as a synonym of *Castalia* (SAV.) SARS, though on what grounds, if Rathke's description is in any way valid, it is hard to understand. The genera of Hesionidæ seem to be badly confused. Our specimens differ from most of the described genera in having the feet distinctly biramous, with two entirely distinct bundles of setæ. However, this is also the case with *Podarke* EHLERS, though expressly placed by Quatrefages among the uniramous forms.

Our specimens, though differing somewhat from the diagnoses, seem to belong to *Hesione* SAVIGNY as understood by Quatrefages; and to *Halimede* RATHKE as understood by Langerhans; while if regard be had strictly to the original descriptions of these genera, they could hardly be referred to either.

Örsted, in his diagnosis of *Castalia*, assigns to it maxillæ, and figures the maxillæ of *Castalia punctata* (Annulatorum Danicorum Conspectus, p. 23, fig. 65). It will be seen that similiar structures exist in our species, but they do not seem to be hard parts. We could spare only one specimen for this examination, but the parts in question appeared to be neither chitinous nor calcareous.

Family SYLLIDÆ.

SYLLIDES *Örsted.*

We accept the genus Syllides on the authority of Professor Langerhans, never having seen the original description. Marion-Bobretzky have described a species of the same genus, referring it to *Anoplosyllis* CLAPARÈDE. Before seeing Langerhans's work on the Syllidæ we proposed to refer our specimens to *Anoplosyllis*, though we were doubtful as to the propriety of so doing.

SYLLIDES CONVOLUTA, *n. sp.*

(PL. II, FIGS 12-16.)

Head (fig. 12) with anterior and posterior margins slightly convex; sides well rounded; length to breadth as three to two; eyes six, bright red; anterior pair very close to the anterior and lateral margins; of the posterior pairs, those in front are largest, and external, the eyes on either side being almost in contact.

The palpi are longer than the head; coalesce along their inner third; outer margin convex; inner margin concave; apex bluntly rounded.

A short conical cirrus, arising from the lower face of the palpi at about the middle point, extends directly downward. This is a peculiar feature, which seems not to have been previously described in any species of this family. The antennæ are claviform; the median longest, about twice the length of the head and palpi together, arising between the posterior eyes; the lateral antennæ arise very near the anterior margin of the head, just outside of the anterior eyes; they are about two-thirds as long as the median.

The tentacular cirri, in all respects similar to the lateral antennæ, arise very near the anterior margin of the segment; the lower cirrus is a little shorter than the upper.

The buccal segment is as long as the next segment.

The dorsal cirri of the first two setigerous segments are a little more slender than the tentacular cirri, but in other respects similar to them; those on the remaining segments are distinctly articulated; they vary in length from two to four times the width of the body. There are three anal cirri, two lateral articulated, a median not articulated. The pharynx reaches to the middle or to the posterior margin of the third segment; we did not make out clearly the structure of its anterior end. The stomach is a little longer than the pharynx, very large, nearly filling the segments, which it occupies; it has the structure common to this group, but in front shows a peculiar organ, as to the character of which we made no notes in the living specimens, having probably failed to observe it. This organ is transversely oval, convex in front, concave behind, and crossed by numerous waved lines, which radiate from the middle point behind. The feet are very long (fig. 16), and bear a long, conical, or finger-shaped ventral cirrus, which points either directly or obliquely backward.

The setæ are from five to seven in each foot, and of two kinds: one (fig. 14) compound, with the appendix delicate, elongated; the other, of which there is but one in each bundle, simple (fig. 15), with a small terminal button. The longest of the compound setæ are about as long as the foot, the others from one-half to two-thirds as long.

The body is much wider in the middle than at either extremity; segments deeply incised, especially along the middle third. Two of the median segments are shown in fig. 13; these are from the same specimen as fig. 12, and are magnified to the same extent.

Body slightly convex above, nearly flat below, colorless; intestine brown, yellowish brown, or reddish brown.

Dorsal cirri and antennæ readily lost. This species throws itself quickly into a coil, very much as is the habit of *Glycera* (*Rhynchobolus*).

Length, 25mm.

Greatest width, 0.2mm (about).

Number of segments, 45.

Number of segments varies from 35 to 50.

Low water, sand, Race Run, near Provincetown.

Marentzeller figures the setæ of *Syllis ochracea* as bidentate; Marion-Bobretzky represent the same setæ as ending in a single point, and both writers give additional simple setæ, which do not exist on our species, but which, as figured by these authors, do not agree with each other. The compound setæ on our species do not seem to be bidentate, but this may be owing to our object-glass not being sufficiently good. Marion-Bobretzky also show a peculiar destitution of the margin of the stem, near its end, not shown by Marentzeller, and not seen in our species.

STREPTOSYLLIS, *n. g.*

Antennæ, three; tentacular cirri, four; dorsal cirri, partly smooth, partly articulated; œsophagus unarmed, with a circle of papillæ at its anterior end; stomach passing directly into the intestines; setæ of two kinds, simple and compound, both kinds covered by a membrane externally;* palpi united for most of their length, turned downward so as not to be visible from above.

It will be seen that this genus agrees in some respects with *Amblyosyllis* GRUBE (*Pterosyllis* CLAPARÈDE), but the head is not "winged"; the setæ are very peculiar, and the dorsal cirri cannot be described either as smooth or moniliform, since both forms occur on the same specimen. It would, perhaps, be well to include the peculiar form of the setæ in the generic description. Unfortunately, we found but one species, and it seems better not to multiply characteristics on such a narrow basis.

STREPTOSYLLIS ARENÆ, *n. sp.*

(PL. II, III, FIGS. 17-23.)

Head convex, sides and front regularly rounded (fig. 17), posterior margin curved forward, posterior angles bluntly rounded. Eyes, six; anterior pair small, crescentic, just behind and outside the origin of the lateral antennæ; outer posterior pair largest, irregularly oval, in contact with the inner pair, or sometimes merged with them; inner posterior pairs small, circular.

The antennæ and tentacular cirri are never annulated, but are more or less regularly wrinkled. They vary much in form. They may taper quite regularly from base to apex, or only along their outer third or fourth, or they may be somewhat clavate. The lateral antennæ arise very close to the anterior margin of the head; they are from three to four times as long as the head. The median antenna, longer than the lateral, arises a little back of the eyes, near the posterior margin of the head.

The buccal segment in alcoholic specimens, or in living contracted specimens, is about one-half as long as the next segment, but in extension it may nearly equal the length of that segment. The upper tentacular cirrus is a little longer than the lower cirrus, a little shorter than the lateral antennæ.

* Stem of compound setæ terminating in four teeth or lobes.

The palpi are large, swollen at base, united along their inner two-thirds, then becoming somewhat flattened, and with their outer angle prolonged into a delicate conical cirrus (fig. 18). As noticed above, they cannot be seen in a dorsal view, being always turned directly downward.

The dorsal cirri are exceedingly variable in form, structure, and length. They may be conical or clavate; wrinkled irregularly (fig. 17); articulated with each article divided longitudinally (fig. 20); articulated without the longitudinal division; or nearly smooth (fig. 19). Their length may be less than the width of the body, or three times the width. All these variations occur on the same specimen, and without any apparent order.

The ventral cirri arise near the end of the foot (fig. 21), are short (relatively) on the first foot, but lengthen rapidly, becoming very long on the fourth segment. They are irregularly wrinkled, often with a deep constriction at the outer third or fourth. They are larger at base than the dorsal cirri of the same segment, and taper regularly to a bluntly rounded apex. They usually are directed backward, but often are coiled (fig. 20). They retain their length even on the posterior segments, and are there longer than the dorsal cirri. There are three anal cirri (fig. 19); a median, which may be as long as the ventral cirri, and two lateral, three to four times as long.

The anal segment is much narrower than the segment preceding it, convex above and below, margin regularly rounded.

The setæ are of two kinds. In every bundle there is one long simple seta (fig. 23), straight or slightly curved, bluntly rounded at its apex, where it is covered with a membrane, which is prolonged along the seta for nearly one-fourth of its length. This seta is always in the upper part of the bundle; in length it is about the same as the stem of the compound setæ.

The compound setæ are numerous, crowded, the terminal part of the stem divided into four distinct processes or lobes, between which the appendix is inserted (fig. 22). The length of the stem is always about equal to the length of the foot, and as the anterior feet are shortest, so also are the stem parts of the anterior setæ. The appendix on the anterior segments is very short, about one-half as long as the one figured, but not differing otherwise. In all the bundles a few of the short forms occur, but do not make up the bundle, as they do on the anterior segments. The appendix is covered with a membrane, which is prolonged down the sides. The œsophagus and stomach have about the same length and diameter, occupying together twelve segments. The œsophagus is strongly convoluted. The "glands" of the stomach are hexagonal, the rows very numerous; a small part of the anterior end of the stomach is without them. There are no special glands back of the stomach, but it is simply reduced in diameter, and prolonged into the intestine. The body is strongly convex above; less so below. The first segment is

about one-half the width of the 10th; from this segment the diameter is nearly uniform, save that the last few segments fall off somewhat rapidly. Body colorless in front; œsophagus light brown; stomach white; back of the stomach the body is yellowish, or light brownish-yellow, with numerous white specks.

Length of largest specimen, 8mm.

Greatest width, 0.5mm.

Number of segments, 55.

Low water; sand.

GRUBEA (*Quatrefages*) *Claparède.*

GRUBEA DOLICHOPODA *Marentzeller.*

Grubea dolichopoda MARENTZELLER. Zur Kentniss der Adriatischen Anneliden, p. 26, pl. iv, fig. 1, 1874.

Grubea tenuicirrata WEBSTER. Annelida Chæt. of New Jersey, p. 109 (corrected in foot-note, p. 110, to *G. dolichopoda.*)

Prof. Langerhans, in his monograph of the SYLLIDÆ (*Zeitschrift für Wissens. Zoöl.*, p. 564, 1879), identifies *G. dolichopoda* MARENTZ. with *G. clavata* CLPD., and regards *G. tenuicirrata* CLPD. as a distinct species. If this conclusion is based only on the descriptions and figures given by Claparède and Marentzeller, and not on examination of the type specimens, it would seem hardly tenable. On the other hand, the differences indicated by Marentzeller between *G. dolichopoda* and *G. tenuicirrata* are very slight; so slight that it seems probable that these forms are identical. There is nothing in the text to indicate that Langerhans examined specimens of *G. tenuicirrata* CLPD., and the differences between this species and *G. clavata*, as understood by him, refer mainly to the terminal points of the compound setæ and to the position of the pharyngeal tooth. As to the fine points of the setæ, Claparède's figures in the *Glanures* are certainly not reliable; and the position of the pharyngeal tooth was not regarded as of so much consequence when he wrote his description as at the present time, when it is regarded not only as a good, but as a sufficient, generic character, at least by Langerhans in his monograph (*l. c.*, p. 526, SYLLIS. —, p. 541, OPISTHOSYLLIS). It may be further noted that Langerhans gives *G. clavata* four anal cirri, while *G. dolichopoda* Marentz. has but three.

Common on stones, shells, &c., at low water.

SPHÆROSYLLIS *Claparède.*

Langerhans, in commenting on the genus SPHÆROSYLLIS, says that Claparède did not sufficiently insist on the coalescence of the buccal segment with the head. He therefore adds as one of the important generic characteristics this union of head and buccal segment. The species described below, from Provincetown, have the buccal segment quite distinct; this is also the case with *S. fortuita* Webster, from Vir-

ginia. Claparède regards the form of the cirri and antennæ, swollen, spherical at base, as a generic characteristic. That this is not valid is shown by *S. fortuita* and also by one of the new forms described below.

SPHÆROSYLLIS BREVIFRONS, *n. sp.*

(PL. III, FIGS. 24–30.)

This species belongs to the typical SPHÆROSYLLIS in the form of the dorsal appendages, in the presence of numerous papillæ, and in general structure, but differs from any heretofore described in the shortness of the palpi, and from all save *S. fortuita* in the presence of a well-marked buccal segment, visible from above.

The head (fig. 24) is short, very wide, almost completely fused with the palpi in front, sides rounded; middle third of the posterior margin convex, encroaching on the buccal segment; the margin, external to the middle third, slightly concave. Eyes, six; the posterior pairs widely separated; those on each side close together; the external pair sometimes crescentic, sometimes oval; the internal small, circular; the anterior pair minute, situated just external to the bases of the lateral antennæ.

The palpi are short, coalesced, slightly emarginate in front.

The antennæ have a swollen, globular base, and a short cylindrical outer part.

The tentacular cirri are like the antennæ, but a little longer.

The buccal segment, according to the state of contraction, may be from one-third to three-fourths as long as the next segment.

The dorsal cirri have also a swollen base, which forms about one-half the entire length. Sometimes the base passes gradually into the outer part; in this case there is usually a single constriction (fig. 26); or the base may be separated by a well-defined constriction from the outer part, in which case the appendix may usually be regarded as composed of two articles (fig. 27).

The anal cirri (fig. 25) are stouter than the dorsal, much swollen at base, without constriction.

The ventral cirri (fig. 26) are slightly flattened, sides nearly straight, apex bluntly rounded, about one-half as long as the dorsal cirri.

In each bundle of setæ is one simple, straight, or slightly curved, seta (figs. 29, 30); the others are compound, and practically all of one kind (fig. 28), differing only in length of stem and appendix.

Pharynx occupying about three segments; stomach a little shorter than the pharynx.

Body, colorless; eyes, red.

Length, 1^{mm}.

Width, 0.17^{mm}.

Number of segments, 22.

Other specimens were larger and with more segments; in no case did the length exceed 1.5mm.

Low water; sand.

A number of specimens, which we are quite unable to separate from this species, were collected by Mr. Benedict at South Norwalk, Conn. They differ only in the length of the buccal segment, which is hardly visible dorsally. This is probably due to different states of contraction, though it seems curious that all of the Provincetown specimens should show the buccal segment plainly, and that none of the specimens from South Norwalk should show it.

Sphærosyllis longicirrata, *n. sp.*

(Pl. VIII, Figs. 95–100.)

Head with the anterior and lateral margins (fig. 95) regularly rounded, posterior margin very slightly convex, nearly straight. The posterior part of the head, bounded in front by a curved line drawn through the bases of the antennæ, is elevated, convex, the part of the head in front of this line being thin, depressed; sometimes the depression is prolonged backward between the eyes for a varying width, giving lateral elevations, on which the four posterior eyes are found.

Eyes, six; the two posterior pairs large, circular, nearly on the same straight line; the anterior pair very small, just in front of the origin of the lateral antennæ.

The antennæ are somewhat fusiform, irregularly constricted, bluntly rounded at apex; median antenna one-third longer than the head and palpi; lateral a little shorter.

The tentacular cirri, dorsal, and anal cirri have the same structure as the antennæ. The dorsal cirri originate some distance within the foot, and are very long for the genus; there is usually a deep constriction at the outer third or fourth, setting off a fusiform appendix. The anal cirri may be double the length of the dorsal.

The buccal segment, in extension, is as long as the second segment.

The palpi are large, convex externally, concave internally, apex bluntly rounded, anterior third free, connected by a thick membrane along their posterior two-thirds; this membrane emarginate in front, and divided into lateral halves by an impressed line, which runs back to the head.

The pharynx occupies four segments, the stomach two.

The feet (fig. 97) are stout, nearly cylindrical, truncated externally. The ventral cirri, bluntly conical, are about one-half the length of the foot in front; behind, as long as the foot.

In each foot is a fan of compound setæ and one simple seta (fig. 100). The compound setæ are very delicate, differing from each other only in length (figs. 98, 99).

Body, colorless; stomach, white; intestines, brown or yellow.

Length, 4–5mm.

Number of segments, 33.

Sexual (capillary) setæ on the male appear at the twelfth segment, and exist on all save the last 3–5 segments.

Common at low water on shells, &c.

PÆDOPHYLAX *Claparède.*

PÆDOPHYLAX HEBES, *n. sp.*

(PL. III, FIGS. 31–36.)

In this species the head (fig. 31) is very short, the width being more than double the length; the anterior angles are very broadly rounded; the anterior and posterior margins but slightly curved. Eyes, six; the anterior pair mere specks; the posterior pairs on each side very close to each other, sometimes in contact; large, circular.

Palpi very large, without indication of division above; below, a narrow sulcus; their length is more than double the length of the head.

The median antenna arises close to the posterior margin of the head, and reaches to the middle, or a little beyond the middle, of the palpi. Its form seems to be variable, but in general the inner third is narrow; the middle third somewhat enlarged; the outer part narrowed, but not so much as the basal part. The lateral antennæ are mere buds, about the size of the tentacular cirri.

The buccal segment is about one-half as long as the second segment; its cirri very short.

The pharynx, in one specimen, occupied the first five segments; the stomach three to four. In another the stomach occupied the eighth and ninth segments.

The dorsal cirri are a trifle larger than the tentacular cirri, but very small; and although the posterior cirri are a little larger than the anterior, they are always smaller than the ventral cirri. These last are conical, minute, arising from the body, within the foot, and reaching about to the apex of the foot. The feet are short, stout, fleshy.

There are two kinds of setæ, simple and compound, with certain slight form variations in each series. On the anterior segments the setæ are all compound (figs. 33, 34), short, with short appendix. At about the beginning of the middle third the simple setæ appear. These are, at first, straight, single pointed setæ (fig. 35), placed dorsally, one to each bundle. On a few of the posterior segments these are replaced by shorter setæ, which have a second sharp point developed below the terminal point (fig. 36).

The anal segment is a little longer than the segment preceding it; it bears three anal cirri—a short median and two lateral—which are double the length of the median antenna. They are more or less fusiform.

The body is widest in the middle; the length and width of the median segments are about equal; length of the anterior segments much less than the width.

Body gray or flesh color. According to the notes made on the living forms, one specimen had dark red eyes; another black eyes.

Length of largest specimen, 7mm.

Number of segments, 44.

In confinement very sluggish, not at all inclined to move about.

From low water to 25 fathoms; sand and shells.

AUTOLYTUS (*Grube*) *Marenzeller.*

AUTOLYTUS CORNUTUS *A. Agassiz.*

A. AGASSIZ. Journal Boston Society Nat. Hist., vol. vii, p. 392, plates 9–11. **1863.**
VERRILL. Invert. Animals of Vin. Snd., etc., p. 590, pl. xii, figs. 65, 66. **1874.**

Wellfleet, low water, in sand.

Provincetown, 25 fathoms, sand and shells.

Not common.

NERILLA *Schmidt.*

(Family not determined.)

NERILLA ANTENNATA *Schmidt.*

Nerilla antennata SCHMIDT. Reise nach der Färör, p. 38, pl. iii, figs. 8, 8a. **1848.**
GRUBE. Fam. der Ann., p. 62. 1856.
CLAPARÈDE. Beobachtungen, etc., p. 48, pl. xii, figs. 16–20. 1863.
Dujardinia antennata QUATREFAGES. Hist. Nat. des Annelés, vol. iii, p. 69. 1865.

We found this species quite abundant in sand at low water. It is unquestionably Schmidt's species.

Family NEREIDÆ.

NEREIS (*L.*) *Cuvier.*

NEREIS VIRENS *Sars.*

Nereis virens SARS. Beskrivelser og Jagttagelser, p. 58, pl. 10, fig. 27. 1835.
Nereis grandis STIMPSON. Marine Invertebrata of Grand Manan, p. 34, fig. 24. 1853.
Nereis Yankiana QUATREFAGES. Histoire des Annelés, vol. i, p. 153, pl. 17, figs. 7–8. 1865.
Atitta virens KINBERG. Annulata Nova, p. 172. 1865.
MALMGREN. Nordiska Hafs-Annulater, p. 183, et Annulata Polychæta, p. 56, pl. iii, fig. 19. 1867.
Nereis virens EHLERS. Borstenwürmer, p. 559, pl. xxii, figs. 29–32. 1868.
VERRILL. Invert. Animals of Vineyard Sound, p. 590, pl. xi, figs. 47–50. 1874.
WEBSTER. Annel. Chæt. of the Virginian Coast, p. 235. 1879.
TURNBULL. Anatomy and Habits of. Trans. Connecticut Academy, vol. iii. 1865.

This species we found, both abundant and large, between tides, ranging nearly to the top of high water.

At Provincetown it was the only shore Nereis, the *N. limbata*, so common everywhere south of the Cape, not being found at Provincetown at all, though found at Wellfleet.

NEREIS LIMBATA *Ehlers.*

EHLERS. Die Borstenwürmer, p. 567. 1868.
VERRILL. Invert. Animals of Vineyard Sound, etc., pp. 318, 590, pl. xi, fig. 51. 1874.
WEBSTER. Annel. Chæt. of the Virginian Coast, p. 235, pl. vi, figs. 70, 75. 1879.
Annel. Chæt. of New Jersey, p. 111, pl. iii, figs. 21, 22. 1880.

We found a number of specimens of this species at Wellfleet in sand and mud. All small. Not found at Provincetown at all, though carefully looked for. At Wellfleet, on some oysters lately brought from Chesapeake Bay, we found a living specimen of *N. limbata.*

NEREIS PELAGICA *Linn.*

This widely distributed species was common at all depths below fifteen fathoms. For synonomy up to 1868, see Ehler's Borstenwürmer, p. 511.

Nereis pelagica LINN. Syst. Nat., ed. x, p. 654; ed. xii, p. 1086.
VERRILL. Invert. Animals of Vineyard Sound, etc., p. 591, pl. xi, figs. 52–55. 1874.
MARENTZELLER. Südjapanische Anneliden, part i, p. 14. 1879.

NEREIS TENUIS *n. sp.*

(PL. III, IV, FIGS. 37–43.)

The width of the head (fig. 37), in its widest part, nearly equal to the length; posterior two-thirds convex, with convex sides; anterior third much narrowed and flattened, and with a median depression running back to the convex part of the head.

Eyes lateral, not quite so regular in outline as shown in the figure; posterior pair a trifle larger than the anterior.

Palpi long, and with long terminal articles, the basal part being a little longer than the head.

Antennæ conical, delicate, close to each other at base, half as long as the head.

The proboscis (fig. 38) has the basal and maxillary rings of about the same length. Paragnathi small, conical, black, arranged as follows: I, wanting; II, single curved series; III, a transverse series, near the posterior margin of the ring; IV, curved line; V, three at the angles of a triangle; VI, wanting; VII and VIII, merged, forming a series, in part single, in part double.

The jaws were not completely exposed; on the part seen there were five stout, rectangular teeth.

Buccal segment a little longer than the second segment.

Tentacular cirri with long cylindrical basal articles, the posterior superior cirrus reaching about to the fourth segment, the others shorter, as shown in the figure.

The dorsal cirri arise from the base of the lingula. On the anterior segments this cirrus is as long as its lingula; it grows progressively shorter to the tenth segment (fig. 39), after which it again lengthens, becoming longer than the lingula on the middle and posterior segments.

The superior lingula and single lip of the dorsal ramus are alike in all respects; stout, conical, close together on the anterior segments, shorter and more divergent behind.

The ventral ramus has but one lip, is shorter and wider than the dorsal, somewhat flattened in front, with the lower margin concave near the apex, but further back tapering regularly.

The ventral lingula is a little shorter than the upper lingula, in all other respects similar to it; on the posterior segments (fig. 40) turned downwards.

The ventral cirrus arises from a small elevation at the base of the ventral lingula; on the anterior segments fusiform (fig. 39), further back (fig. 40) more regularly conical.

The setæ are of three kinds (figs. 41, 42, 43). Those of the upper ramus are short, hardly reaching beyond the ramus, appendix very delicate, terminal points of stem of same length (fig. 41). Those of the lower ramus in two bundles; in the upper part of the upper bundle the setæ are the same as those described above (fig. 41); in the lower part of the same bundle a few with short appendix (falcate), curved near the end, apex bluntly rounded (fig. 43); in the lower bundle, anterior segments, many like fig. 43, a few like fig. 42; further back the falcate setæ become less numerous. In the single specimen found the setæ of the dorsal rami, after the first few segments, had all been lost. At first there is a single black acicula in each ramus; further back a second acicula, slender, uncolored, appears in the dorsal ramus.

The body was colorless except as colored by the blood, which showed through very plainly; bases of feet opaque white, this color being due to glands within them.

Length, 45^{mm}.

Width, 1.2^{mm}.

Posterior third tapering a trifle. This is the most delicate *Nereis* described from our coast. It is easily recognized by its extreme narrowness as compared with its length.

But one specimen was taken, off Race Run, near Provincetown; 20 to 25 fathoms, mud and sand.

Family EUNICIDÆ.

DIOPATRA *Quatrefages.*

DIOPATRA CUPREA *Claparède.*

Nereis cuprea, Bosc. Hist. Nat. des Vers., Vol. i, p. 143 (*teste* Claparède). 1802.
Eunice cuprea QUATREFAGES. Hist. Nat. des Annèles, vol. i, p. 331. 1865.
Diopatra cuprea CLAPARÈDE. Annel. Chét. du Golfe de Naples, p. 432. 1868.
VERRILL. Invert. Animals of Vin. Sound, p. 593, pl. xiii, figs. 67, 68. 1874.
WEBSTER. Annel. Chæt. of the Virginian Coast, p. 236. 1879. Annel. Chæt. of New Jersey, p. 115.

Found sparingly at Provincetown; very common at Wellfleet, in the harbor, at low water; sand and sandy mud.

NINOE Kinberg.

NINOE NIGRIPES *Verrill.*

Invertebrate Animals of Vineyard Sound, p. 595. 1874.

Dredged in from 12 to 20 fathoms; sand, shells.

LUMBRINEREIS (*Blainville*) *Ehlers.*

LUMBRINEREIS FRAGILIS *Audouin and M. Edwards.*

Lumbricus fragilis MÜLLER. Prodr. Zool. Dan. p. 216, n. 2611 (*teste* Malmgren). Zool. Dan. vol. 1, p. 22, pl. xxii, figs. 1–3. 1788.
Scoletoma fragilis BLAINVILLE. Dict. des Sci. Nat., Article *Vers*, p. 492 (*teste Aud. and M. Ed.*).
Lumbrinereis fragilis AUDOUIN and M. EDWARDS. Littoral de la France, vol. i, p. 170. 1834.
QUATREFAGES. Hist. Nat. des *Annèles*, vol. i, p. 365. 1865.
Lumbriconereis fragilis ÖRSTED. Consp. Ann. Dan. p. 15, figs. 1, 2. 1843. Danielssen, Reise, p. 50. 1857. Reise, p. 116. 1858. (*teste* Malmgren).
MALMGREN. Annulata Polychæta, p 177, pl. xv, figs. 83–83 D. 1867.
EHLERS. Die Borstenwürmur, p. 395. 1868.
VERRILL. Invert. Animals of Vineyard Sound, p. 594. 1874.
LANGERHANS. Zeitschrift für wissenschaftliche Zoölogie, p. 297. 1879.
Lumbriconereis borealis KINBERG. Annulata Nova Öfvers af K. Vet.-Akad Förh, No. 10, p. 568. 1864.
Lumbriconereis madeirensis. KINBERG. l. c., p. 559 (*teste* Langerhans).

Very fine large specimens were dredged. Its resemblance to *Ninoe nigripes* Verrill is very striking.

Twenty to thirty fathoms; sand and shells.

LUMBRINEREIS TENUIS *Verrill.*

Invert. Animals of Vin. Sound, etc., p. 594. 1874.

This species was not often taken. Sand, low water.

DRILONEREIS *Claparède.*

DRILONEREIS LONGA *Webster.*

Annel. Chæt. of the Virginian Coast, etc., p. 240, pl. vii, figs. 84–88. 1879. Annel. Chæt. of New Jersey, p. 116. 1880.

Quite abundant in sand at low water.

ARABELLA (*Grube*) *Ehlers.*

ARABELLA OPALINA *Verrill.*

Lumbriconereis splendida LEIDY. Marine Invert. Fauna of R. I. and N. J., p. 10. 1855.
Lumbriconereis opalina VERRILL. Invert. An. of Vin. Sound, p. 594, pl. xiii, figs. 69, 70. 1874.
Arabella opalina VERRILL. Proc. Acad. Nat. Sciences, Philadelphia, for 1878, p. 299.
WEBSTER. Annel. Chæt. of the Virginian Coast, p. 242. 1879. Annel. Chæt. of New Jersey, p. 116. 1880.

Very common at low water in sand.

STAUROCEPHALUS (*Grube*) *Ehlers.*

STAUROCEPHALUS PALLIDUS *Verrill.*

VERRILL. Invert. Animals of Vineyard Sound, p. 595. 1874.
WEBSTER. Annel. Chæt. of the Virginian Coast, p. 242. 1879. Annel. Chæt. of New Jersey, p. 116. 1880.

Very rare. Only two specimens were taken. Sand; low water.

STAUROCEPHALUS CÆCUS *n. sp.*

(PL. IV, FIGS. 44, 44*a*–48.)

The head of this species is constricted just in front of the origin of the antennæ, the widest part being back of the antennæ, where the width exceeds the length; the anterior part is regularly curved, obtuse (fig. 44). There are no eyes.

The antennæ are quite long, composed of about fifteen articles; increasing slightly in diameter from origin along the inner third, then tapering gradually to the end; the last three or four articles elongated.

The palpi are stout, transversely wrinkled, canaliculate; terminal article fusiform, bluntly rounded at apex, forming nearly one-third the entire length.

The first two segments are about equal in length, a little longer than those following them.

The dorsal cirri (fig. 45) have a terminal article shaped like the corresponding part of the palpi; they are nearly cylindrical, reach just beyond the foot.

The ventral cirri are short, fusiform, arising near the apex of the foot and reaching a little beyond it.

The foot ends in three rounded lobes, of which the upper (fig. 45) is very large, the two lower small and projecting beyond the upper, divergent. The anterior feet are in length about one-half the width of the body, growing progressively longer along the anterior third, from which point their length equals the width of the segments to which they are attached.

The anal segment is about double the length of the segment preceding it. There are three anal cirri; the lateral cirri are made up of from three to five nearly cylindrical articles, each one slightly less in diameter than the one preceding it, and in length equal to the anal segment; the median cirrus is in all respects similar to the basal article of the lateral.

There are two kinds of setæ in the upper bundle; in the upper part one to three very delicate capillary setæ (fig. 46) minutely denticulated along one edge for some distance; below these, two or three having a very peculiar form (fig. 47); these are about two-thirds as long as the first form, inner three-fourths of uniform diameter, near the end denticulated, external tooth sharp pointed, prolonged nearly in the line of the main part of the seta; external to the base of this tooth the seta becomes suddenly very delicate, capillary. These setæ may be curved, as in the figure, or straight. In the lower bundle only compound setæ (fig. 48) are found. These are arranged in a fan, growing progressively shorter from the upper to the lower part of the fan, the shortening, for the most part, affecting the appendix. With such magnifying power as we had the appendix of these setæ seemed to have the apex bluntly rounded, without tooth.

The body was convex above and at the sides, flattened below; the segments distinctly separated from each other by well-impressed lines of segmentation.

The general color was white.

Length of largest specimen, 8^{mm}.

Width, 0.5^{mm}.

Number of segments, 51.

In young specimens the antennæ and palpi appear as mere buds. The head is larger relatively than in adults. The dorsal cirri have no basal articles, but arise, like the ventral cirri in mature forms, from the side of the foot, near the end. They moved with a perfectly uniform gliding motion, due, no doubt, to the action of cilia, without any apparent effort of the body or feet. In a more advanced stage the palpi were club-shaped, lacking the terminal article.

Very common in sand at low water. The young forms were especially numerous.

Family GLYCERIDÆ.

RHYNCHOBOLUS *Claparède.*

RHYNCHOBOLUS DIBRANCHIATUS *Verrill.*

Glycera dibranchiata EHLERS. Borstenwürmer, p. 670, pl. xxiv, figs. 1, 10–28. 1868.
GRUBE. Jahres-Bericht der Schles. Gesell. für vater län Cultur, p. 64. 1869.
Rhynchobolus dibranchiatus VERRILL. Invert. An. of Vin. Sound, etc., p. 596, pl. x, figs. 43, 44. 1874.
WEBSTER. Annel. Chæt. of the Virginian Coast, etc., p. 245. 1879. Annel. Chæt. of New Jersey, p. 117. 1880.

Very common in sand at low water.

GONIADA *Audouin and M. Edwards.*

GONIADA GRACILIS *Verrill.*

(PL. V, FIGS. 49–52.)

Eone gracilis VERRILL. Invert. An. of Vin Sound, etc., p. 596. 1874.
Goniada gracilis VERRILL. Proceedings U. S. National Museum, p. 174. 1879.

We found in the fine sand of the harbor, at about half-tide, a number of specimens evidently referable to *Goniada*, and which we regarded as undescribed. Professor Verrill, however, regarded them as belonging to the species described by him as *Eone gracilis*, since changed to *Goniada gracilis*, as above.

The apex of the head (fig. 49) is nearly hexagonal.

The antennæ are composed of three articles, of which the inner forms over half the entire length; the outer articles are about equal in length; the diameter decreases progressively; external article very delicate.

The first and sixth segments of the head bear each a pair of minute eyes; those on the sixth segment not always demonstrable in alcoholic specimens.

The dorsal cirri on a few of the anterior segments and the ventral cirri back of the middle of the body are rounded; elsewhere they are somewhat flattened, as is, also, the lower lip of the lower ramus.

The dorsal ramus appears at the 27th segment.

The setæ of this ramus are short, simple, a little curved at the apex.

From the 26th–30th segment the long compound setæ of the ventral ramus become much elongated, the appendix, especially, being very long and delicate. (Compare fig. 50 with fig. 52.)

This may be a sexual peculiarity; but, as all the specimens taken were sexually mature, we had no means of determining this point.

The normal color would seem to be yellowish-white; this changes to pure white in the males after the 30th, and to flesh-color, varying from light to dark, in the females, after the 20th segment. The eggs are

large, crowded, flesh-colored, determining the color of the body, in the females, given above.

In confinement they were very active, moving about rapidly, and throwing themselves into coils, after the manner of *Rhynchobolus*.

Length in contraction, 35—50mm.

Greatest diameter—1mm.

They taper rapidly along a few of the anterior and posterior segments; otherwise the diameter is uniform.

Found sparingly, burrowing in the finest sand of the harbor; half-tide to low water.

Family ARICIIDÆ.

ARICIA (*Savigny*) *Audouin and M. Edwards.*

ARICIA ORNATA *Verrill.*

Invert. An. of Vin. Sound, etc., p. 596. 1874.

Not common. A few very fine large specimens were taken at extreme low water, in sandy mud.

SCOLOPLOS *Örsted.*

SCOLOPLOS ROBUSTA.

Anthostoma robustum VERRILL. Op. cit., p. 597, pl. xiv, fig. 76. 1874.
WEBSTER. Annel. Chæt. of the Virginian Coast, p. 258. 1879.

All the specimens taken were small. Sand; low water.

SCOLOPLOS FRAGILIS.

Anthostoma fragile VERRILL. Op. cit., p. 598. 1874.
WEBSTER. Annel. Chæt. of Virginian Coast, p. 258. 1879. Of New Jersey, p. 121. 1880.

Common, especially at Wellfleet. Sand; low water.

Family OPHELIIDÆ.

OPLILIA (*Savigny*) *M. Edwards.*

OPHELIA LIMACINA *Sars.*

Ammotrypane limacina H. RATHKE. Nov. Act. Nat. Cur., vol. xxi, p. 190, pl. x, figs. 4–8. 1840.
GRUBE. Fam. der Ann., p. 70. 1851.
KOREN. Nyt. Mag., vol. ix, p. 94 (*teste* Malmgren).
JOHNSTON. Cat. Brit. Mus., p. 217. 1865.
QUATREFAGES. Hist. Nat. des Ann., vol. ii, p. 279. 1865.

Ophelia bicornis ÖRSTED. Grönlands Annulata Dorsibranchiata, p. 32, figs. 104, 105, 115, 116, 121. 1843.

Ophelia bicornis SARS. Nyt. Mag., vol. vi, p. 207.
Ophelia limacina SARS. Nyt. Mag., vol. vii, p. 381 (*teste* Malmgren).
Ophelia borealis QUATREFAGES. Hist. Nat, des. Ann., vol. ii, p. 273. **1865.**

Quite common in the sand, at low water.

AMMOTRYPANE *H. Rathke.*

AMMOTRYPANE FIMBRIATA *Verrill.*

Invert. An. of Vin. Sound, etc., p. 604, pl. xv., fig. 79. 1874.

Only one specimen was taken. Sand; low water. Wellfleet.

Family THELETHUSIDÆ.

ARENICOLA *Lamarck.*

ARENICOLA MARINA *Malmgren.*

Lumbricus marinus LINN. Syst. Nat., ed. xii, vol. i, p. 1077.
Lumbricus papillosus O. FABRICIUS. Fauna Grönlandica, p. 283. 1780.
Arenicola piscatorum LAMARCK. Syst. d. An. sans. Vert., p. 324. Hist. Nat. An. sans. Vert., 2d ed., vol. v, p. 580 (t. Malmgren).
AUD. AND M. EDWARDS. Littoral de la France, vol. ii, p. 285, pl. 8, figs. 8–12. 1834.
JOHNSTON. Cat. Brit. Mus., p. 287. 1865.
Arenicola marina malmgren Annulata Polychæta, p. 188. 1867.

The specimens of this species were all collected in one locality, at Race Run, in coarse sand. We did not find it in Provincetown harbor or at Wellfleet, though the conditions seemed to be favorable, and we looked for it with care. At Race Run were obtained numerous specimens, but they were all small.

Family CHLORÆMIDÆ.

TROPHONIA *M. Edwards.*

TROPHONIA AFFINIS *Verrill.*

Siphonostomum affine LEIDY. Marine Invert. Fauna of R. I. and N. J., p. 16, 1855.
Trophonia affinis VERRILL. Op. cit., p. 605, pl. xiv, fig. 75. 1874.

Only two specimens were collected. Low water; sand.

Family STERNASPIDÆ.

STERNASPIS *Otto.*

STERNASPIS FOSSOR *Stimpson.*

STIMPSON. Marine Invert. of Grand Menan, p. 29, fig. 19. 1854.
VERRILL. Invert. An. of Vin. Sound, p. 606, pl. xiv, fig. 74.

Abundant; dredged; 20–30 fathoms.

Family CHÆTOPTERIDÆ.

SPIOCHÆTOPTERUS *Sars.*

SPIOCHÆTOPTERUS OCULATUS *Webster.*

Annel. Chæt. of the Virginian Coast, etc., p. 247, pl. viii, figs. 98–102. 1879.—Annel. Chæt. of New Jersey, p. 118. 1880.

We found this species in great numbers at Wellfleet. Here a great area of sand-flat is exposed at low water, drained by swiftly running streams. It is along the borders of these streams that this species is most abundant. Often 6 or 8 could be obtained from a single "dig" of the spade. It occured under the same conditions in Virginia and New Jersey, but much more sparingly. These three localities are the only ones reported up to this time.

Family SPIONIDÆ.

SCOLECOLEPIS *Blainville.*

SCOLECOLEPIS VIRIDIS *Verrill.*

VERRILL. Invert. Animals of Vin. Sound, etc., p. 600. 1874.
WEBSTER. Annel. Chæt. of New Jersey, p. 118. 1880.

Wellfleet. Rare, only one specimen taken. Sand, low water.

SCOLECOLEPIS CIRRATA *Malmgren.*

Nerine cirrata SARS. Nyt. Mag., vol. vi, p. 207 (*teste* Malmgren).
Scolecolepis cirrata MALMGREN. Annulata Polychæta, p. 199, pl. x, fig. 54. 1867.
VERRILL. Invert. An. of Vin. Sound, p. 602. 1874.

Not common. Dredged in from 20–30 fathoms; sand.

SPIO (*O. Fabr.*) *Örsted.*

SPIO SETOSA *Verrill.*

VERRILL. Op. cit., p. 602, pl. xiv, fig. 71. 1874.
WEBSTER. Annel. Chæt. of N. J., p. 119. 1880.

Provincetown; low water to 25 fathoms.
Wellfleet; low water, sand.
Common.

(SPIO RATHBUNI, *n. sp.*

(PL. V, FIGS. 53–59.)

Head oval (fig. 53), length about double the width, sides very slightly convex; anterior end divided into two rounded lobes; posterior end a little narrower than the anterior; the anterior third of the head, together

with a narrow lateral space, depressed, flattened; the remaining part of the head somewhat elevated.

Eyes small, black; variable both in number, position, and form; not the same in any of these respects on any two specimens.

Tentacles of the form usual in this group, rather stout, reaching back to the eighth segment, tapering slightly, the diameter at the apex being about one-half that at the base.

The buccal segment is very large, reaching in front to the anterior margin of the head; at the sides and behind extending far beyond the head; it has both dorsal and ventral rami, of the same form as those of the next segment, but not quite so large.

The dorsal rami of the non-branchiated segments consist of an anterior, low, rounded, lobe; and a posterior, somewhat elongated and flattened, cirrus.

The ventral rami of the first ten segments do not differ materially from the dorsal rami; after the tenth segment the ventral cirri grow progressively smaller and disappear; the anterior lobe, now become lateral and transverse, is lengthened and depressed (fig. 55).

On the branchiated segments nothing remains of the dorsal ramus but a conical elevation from which the setæ arise.

The branchiæ begin on the thirteenth segment (fig. 55). They are slightly wider at either extremity than in the middle, apex very widely rounded; outer margin with a wide membrane reaching from base to apex; inner margin, as well as an elevated membranous ridge uniting the bases of the opposite branchiæ, with very long, densely crowded cilia: on the largest specimen taken there were 23 pair of branchiæ followed by 15 non-branchiated segments.

The setæ of the first eight segments are all capillary, mostly long and delicate; those of the dorsal rami longer than the ventral. In both rami are a few shorter setæ, somewhat wider along their inner two-thirds (fig. 56).

The dorsal setæ of the branchiated region are a little shortened, but back of the branchiæ grow long again, and are even more delicate than in front.

On the 9th segment the ventral setæ are changed to hooks (fig. 58), of which there are from 4 to 7 in each rami; they project but slightly beyond the setigerous lobe, and are covered by a delicate membrane.

The anal segment ends in four short, stout, bluntly conical lobes (fig. 59). The body is flattened above, convex laterally and below. Impressed lines, running along the ventral surface, include the middle half of this surface; these, being crossed by the lines of segmentation, furnish median ventral plates.

The extended proboscis was not seen.

The posterior margin of the mouth is crenulated; the anterior margin of the buccal segment is divided by a longitudinal median incision into two rounded lobes, which may be widely separated or closely approximated.

Largest specimen.

Length, 10mm.
Width, 0.5mm.
Number of segments, 49.
This species lives in delicate sand tubes; low water.

PRIONOSPIO (*Malmgren*) *Sars.*

Prionospio (species not determined).

A single specimen, too much injured for identification, was dredged in the harbor. Bottom muddy, covered with dead eel-grass.

STREBLOSPIO *Webster.*

Streblospio Benedicti *Webster.*

(Pl. V, Figs. 60-64.)

Annel. Chæt. of New Jersey, p. 120, pl. v, figs. 48-50. 1880.

The head (fig. 6) is emarginate in front. The lobes of the dorsal and ventral rami do not disappear as stated in the original description, but become much smaller; the error arose from not studying transverse sections.

We found this species in great numbers at Wellfleet, above the harbor, living in soft, black mud, which formed a layer, two or three inches thick, over compact sand. The tubes were placed vertically in the mud, very close together. They were not as large as the specimens found in New Jersey.

The anal segment has a shallow sucker (fig. 64), with thick, rounded margin.

SPIOPHANES *Grube.*

Spiophanes Verrilli *n. sp.*

(Pl. VI, Figs. 65-72.)

Head (fig. 66) resting on the buccal segment; posterior half raised, presenting somewhat the appearance of a carina; anterior half rapidly widening, thin, depressed, with anterior angles much prolonged. Eyes four, small, black, lateral; anterior pair about on the middle line; posterior pair half way between the anterior pair and the posterior margin of the head.

We were unable to find the minute posterior antenna represented as belonging to this genus.

Tentacles (fig. 65) reaching back to the eighth segment; canaliculate, margins of canal rounded and scolloped.

The dorsal cirri on the anterior segments are wide at base, narrowed at about the middle, with their outer half conical (fig 67); the base gradually becomes more swollen, the apex more attenuated, until the middle

line is reached, when the basal part becomes smaller, the outer part longer, with a slight increase in its diameter. Back of the dorsal cirri of the anterior segments is a thin plate, with convex margin, in front of which the setæ arise. This plate exists on all segments, but after a few of the anterior becomes narrower, longer, conical (fig. 69).

The ventral cirri of the first four segments are a little smaller than the dorsal cirri; they have a straight upper, a convex lower, margin; behind them is a plate or lobe similar to the dorsal ramus; back of the fourth segment the cirrus disappears, and the ventral ramus moves gradually towards the ventral margin (fig. 69). After the fourth segment a projecting, arched plate, similar to the ventral ramus, is found about half way between the two rami.

From the sixth segment a membranous densely ciliated ridge (fig. 68) connects the bases of the opposite dorsal cirri. At first this ridge is quite low, but afterwards becomes well marked.

The dorsal setæ of the anterior segments are very long (fig. 70), delicate, margined on one edge; they shorten a little backwards, but behind the middle again increase in length.

The ventral setæ (fig. 71) are shorter, more curved, and a little wider; in other respects similar to the dorsal setæ. On the sixth segment the ventral setæ change to uncini (fig. 72). These project very slightly. There are a few capillary setæ at the lower end of each series of uncini. The anal segment is bluntly rounded, with two delicate filiform cirri.

On the anterior segments the dorsum is flat; the sides and ventral surface convex; further back the dorsum becomes convex; the sides nearly straight; the ventral surface flat, or slightly convex.

General color of the body red; head, sides of body, and feet, white. Only two specimens were found.

Length of largest specimen, 21mm.

Width, 1mm.

Number of segments, 82.

Found at Wellfleet, in sand, at low water.

POLYDORA *Bosc.*

POLYDORA LIGNI *Webster.*

Annel. Chæt. of New Jersey, etc., p. 119, pl. v, figs. 45–47. 1880.

Our specimens were found living on the valves of *Pecten irradians*, their tubes occupying the spaces between the ribs.

Low water; not common.

POLYDORA CONCHARUM *Verrill.*

Proceedings of the United States National Museum, p. 174. November, 1879.

This large and peculiar species was very common, from near high water mark to 30 fathoms.

Family CIRRATULIDÆ.

CIRRATULUS *Lamarck.*

CIRRATULUS GRANDIS *Verrill.*

VERRILL. Invert. Animals of Vineyard Sound, etc., p. 606, pl. xv, figs. 80, 81. 1874.
WEBSTER. Annel. Chæt. of the Virginian Coast, etc., p. 258. 1879. Annel. Chæt. of New Jersey, p. 122. 1880.

Specimens rare, not large. Found under stones, at low water.

DODECACERIA *Örsted.*

DODECACERIA CONCHARUM *Örsted.*

ÖRSTED. Ann. Dan. Consp., p. 44, fig. 99. 1843.
JOHNSTON. Catl. Brit. Museum, p. 212. 1865.
QUATREFAGES. Hist. Nat. des Ann., vol. i,, p. 464. 1865.
MALMGREN. Annulata Polychæta, p. 206. 1867.
VERRILL. Proceedings United States National Museum, p. 178. 1879.

One specimen only. Twenty to twenty-five fathoms; sand and shells.

Family CAPITELLIDÆ.

NOTOMASTUS *Sars.*

NOTOMASTUS FILIFORMIS *Verrill.*

VERRILL. Invert. An. of Vin. Sound, etc., p. 611. 1874.
WEBSTER. Annel. Chæt. of New Jersey, p. 123, pl. v, figs. 51–54. 1880.

Very abundant at low water, in the sand.

NOTOMASTUS LURIDUS *Verrill.*

VERRILL. Op. cit., p. 610. 1874.
WEBSTER. Op. cit., p. 123. 1880.

Quite common at low water; sand.

CAPITELLA *Blainville.*

CAPITELLA CAPITATA *Van Beneden.*

Lumbricus capitatus FABRICIUS. Fauna Grön., p. 279. 1780.
Capitella Fabricii BLAINVILLE. Dict. des Sc. Nat., vol. 57, p. 443. 1828 (*teste* Clpd.).
Lumbriconais capitata FREY and LEUCK. Beiträge z. Kenntn. wirbelloser Thiere, p. 141. 1847.
Capitella capitata VAN BENEDEN. Bull. Acad. de Belg., vol. iii, 1857, *teste* Claparède CLAPARÈDE, Rech. Anat. Annélides des Hébrides, p. 42, pl. i, figs 9–14. 1861. Annel. Chæt. du G. de N., part ii, p. 10, pl. xxvii fig. 1. 1868.
Capitella capitata MALMGREN. Annulata Polychæta, p. 207. 1867.
MCINTOSH. Annelida of the cruise of the Valorous to Davis Strait, p. 507. 1877.
Valkeria ciliata JOHNSTON. Cat. British Worms, p. 67. 1865.

We found a few specimens of *Capitella*, which we are not able to separate from *C. capitata*. Sexual setæ on the eighth and ninth segments; all segments before the eighth with capillary setæ only; after the ninth, with uncini only. On one young specimen capillary setæ were found only on three segments. Another had five segments with capillary setæ; still another had capillary setæ on seven segments, but there were a few uncini in the seventh ventral ramus.

Near high water mark, in sand.

Family MALDANIDÆ.

NICOMACHE *Malmgren.*

NICOMACHE LUMBRICALIS *Malmgren.*

Sabella lumbricalis O. FABRICIUS. Fauna Grön., p. 374. 1780.
Clymene lumbricalis SARS. Fauna littoralis norvegiæ, vol. ii, p. 16, pl. ii, figs. 23–26. 1856.
Nicomache lumbricalis MALMGREN. Nordiska Hafs-Annulater, p. 190. 1865. Annulata Polychæta, p. 209, pl. xi, fig. 60. 1867.

Dredged, 12 to 28 fathoms.

PRAXILLA *Malmgren.*

PRAXILLA ELONGATA *Webster.*

Annel. Chæt. of New Jersey, p. 124, pl. vi, figs. 55–59. 1880.

We found this species quite common both at Provincetown and Wellfleet, living in sand and gravel. At Wellfleet associated with *Amphitrite ornata* VERRILL.

CLYMENELLA *Verrill.*

CLYMENELLA TORQUATA *Verrill.*

Clymene torquatus LEIDY. Marine Invert. Fauna of Rhode Island and New Jersey, p. 14. 1855.
Clymenella torquata. VERRILL. Invert. An. of Vin. Sound, p. 608, pl. xiv, figs. 71–73. 1874.
WEBSTER. Annel. Chæt. of the Virginian Coast, p. 258. 1879. Of New Jersey, p. 123. 1880.

Very abundant, low water, sand and gravel.

Family AMPHICTENIDÆ.

CISTENIDES *Malmgren.*

CISTENIDES GOULDII *Verrill.*

Pectinaria Belgica GOULD. Invertebrata of Mass., ed. i, p. 7, pl. i, fig. 1. 1841.
Pectinaria auricoma LEIDY. Marine Invert. Fauna of Rhode Island and New Jersey, p. 14. 1855.
Cistenides Gouldii VERRILL. Op. cit., p. 612, pl. xvii, figs. 87, 87 a. 1874.
WEBSTER. Op. cit. (N. J.), p. 127. 1880.

Common and very large. Low water. Wellfleet and Provincetown.

AMPHARETIDÆ.

MELINNA *Malmgren.*

MELINNA CRISTATA *Malmgren.*

Sabella cristata SARS. Fauna littoralis Norvegiæ, vol. ii, p. 19, pl. ii, figs. 1–7. 1856.
Melinna cristata MALMGREN. Nordiska Hafs-Annulater, p. 371, pl. xx, fig. 50. 1865.
Ann. Polych., p. 215. 1867.
VERRILL. Op. cit., p. 613. 1874.
Phenacia cristata QUATREFAGES. Hist. Nat. des Ann., vol. ii, p. 377. 1865.

Single much injured specimen. Dredged; 25 fathoms.

Family TEREBELLIDÆ.

AMPHITRITE (*Müller*) *Malmgren.*

AMPHITRITE ORNATA *Verrill.*

Terebella ornata LEIDY.—Marine Invert. Fauna of R. I. and N. J., p. 14, pl. xi, figs. 44, 45. 1855.
Amphitrite ornata VERRILL.—Invert. An. of Vineyard Sound, etc., p. 613, pl. xvi, fig. 82. 1874.
Amphitrite ornata WEBSTER.—Annel. Chæt. of the Virginian Coast, p. 262. 1879. Annel. Chæt. of N. J., p. 127. 1880.

This species was very rare at Provincetown, but we found it in great numbers at Wellfleet, in coarse sand and mud, very near high water mark.

AMPHITRITE BRUNNEA *Verrill.*

Terebella brunnea STIMPSON.—Marine Invert. of Grand Manan, p. 31. 1854.
Amphitrite Johnstoni MALMGREN.—Nord. Hafs-Annulater, p. 377, pl. xxi, fig. 51. 1865. Annulata Polychæta, p. 216. 1867.
Amphitrite brunnea VERRILL.—Check-list.

Professor Verrill regards *A. Johnstoni* MALMGREN as a synonym of *T. brunnea* STIMPSON. Stimpson's description, however, is very imperfect. We found two specimens which agree in most particulars, though not in all, with Malmgren's figures of *A. Johnstoni*. They have twenty-four segments with capillary setæ. A very fine large species, dredged in deep water by the Fish Commission, and regarded at first by Professor Verrill as *A. brunnea*, has twenty-five segments with capillary setæ. Our specimens of *A. brunnea* were found under stones, at low-water.

NICOLEA *Malmgren.*

NICOLEA VIRIDIS *n. sp.*

(PL. VI, FIGS. 73, 74.)

The frontal membrane is very large; the tentacles numerous and long, some of them as long as the body.

The branchiæ are divided from near the base, flattened, ending in short blunt subdivisions (fig. 73). The anterior branchiæ are much larger than the posterior.

The uncigerous tori on the segments bearing capillary setæ are large, projecting, convex externally; then follow eight segments, on which the tori are much smaller, and square; then three segments, apparently without setæ; then a short anal segment, with crenulated margin.

No lines of segmentation can be made out in living specimens on the dorsum and sides as far back as the last segment with capillary setæ; on alcoholic specimens they are faintly perceptible.

The cirri of the third and fourth setigerous segments of the male form are small, flattened, quadrangular.

The uncinate setæ have one very large tooth at the apex (fig. 74).

The body tapers very gradually, the diameter of the last segment being about one-half that of the anterior segments.

The general color is green; anterior two-thirds with numerous irregular black specks on the dorsum and sides; these become larger and confluent on the posterior segments, forming spots or blotches. First segment crossed by a band of dark reddish-brown specks (? eye specks), closely crowded; tentacles light flesh-color; branchiæ with dark-brown center.

A single specimen, a male, was taken in sand, at low water.

Length, 9mm.

Greatest width, 1mm.

PISTA *Malmgren.*

In the Invertebrate Animals of Vineyard Sound, etc., Professor Verrill has described a new genus, *Scionopsis*, which he says is closely related to *Pista*, differing from that genus in the extent of the membrane on the third segment, and in the structure of the branchiæ. We found at Wellfleet a form which seems to be intermediate between *Pista* and *Scionopsis*. In the form of the uncinate setæ and in the lateral membrane on the second and third segments it agrees with *Pista;* until closely examined the branchiæ seem also to agree with *Pista*, since, owing to the arrangement on the stem, they present the same peculiar form. However, in the method of branching they agree with *Scionopsis*. It seems best, for the present at least, to refer both this new form and *Scionopsis* VERRILL to *Pista*.

PISTA INTERMEDIA *n. sp.*

(PL. VI, FIGS. 75–78.)

The branchiæ in this species arise from an elongated central stalk, the basal portion of which is naked (without branches) for a variable length, depending upon the size of the branchiæ. The branches are given off from the stem very close to each other, and appear to be ar-

ranged in a very slowly ascending spiral. Each main branch subdivides close to its origin, and again divides; there is a strong tendency to terminate in a short bifurcation, one branch of which is a little longer than the other (fig. 75). The lowest main branches are the largest. They are convex externally, concave internally, directed upward and a little outward. The main branches grow rapidly shorter from base to summit, and tend more directly outward. The result of this arrangement is an egg-shaped branchia, the small end outward. There would appear to be normally four branchiæ, but none of our specimens show more than three.

The tentacular cirri are short, numerous.

The lateral membrane of the second segment is short but high; outer margin convex; the corresponding membrane of the third segment is lower, but extends from the dorsal to the ventral surface.

The anterior ventral shields are very short; the others are variable in form; they may be square, or their length may be more or less than their width.

There are two series of capillary setæ (figs. 76, 77), the setæ not differing much from each other except in length.

The uncini of the anterior segments (fig. 78) do not differ much from those further back, and will be seen to closely resemble those of *Pista cristata*, as figured by Malmgren. The elongated inferior process, said by Malmgren to exist on the uncini of the first six uncigerous segments in this species, we found on all uncini. It does not seem, however, to be a process of the uncini, but a tendon or cord, derived from a membrane, which, in part at least, covers each uncinus. We were able to trace this membrane to the extent shown in fig. 78. On all the species of this family which we have had an opportunity to examine we have found a similar membrane and similar cords, when sufficient care has been taken with the preparation of the uncini for examination. It may further be noted, both as regards this species and *Pista palmata*, that the uncini are not simply flattened with a single series of terminal points, but that the apex is much widened, with transverse series of points, each series composed of from three to five points, corresponding to the single series seen when the uncinus is viewed from the side.

The notes on color were made by Professor Verrill. Anterior region dull olive-green dorsally, sometimes tinged with reddish, and usually with more or less distinct transverse lines of reddish between the segments, these lines less marked in front. On the sides each torus is surrounded by a broad band of dark blood-red, and above each setigerous fascicle, except in front, there is a red spot. On the sides, between the segments, are narrow pale-olive sutural bands. Ventral surface pale-olive or yellowish-green. Each ventral shield with a conspicuous red spot on the lateral borders, those on the posterior shields being connected with the lateral bands. Feet, pale greenish. Posterior portion

of body plain yellowish-green or olive green. Branchiæ greenish, or yellowish, or flesh-color with bright red blood vessels showing through.

Length of largest specimen, 75mm.

Tube formed of coarse sand.

Found at Wellfleet in sand at low water.

Not common.

PISTA PALMATA.

(PL. VII, FIG. 79.)

Scionopsis palmata VERRILL. Invert. Animals of Vin. Sound, p. 614. 1874.
Scionopsis palmata WEBSTER. Annel. Chæt. of the Virginia Coast, p. 262, 1879. Of New Jersey, p. 128. 1880.

Found sparingly at low water.

The considerations that lead us to unite this form to *Pista* have been stated above.

TRICHOBRANCHUS *Malmgren.*

TRICHOBRANCHUS ? GLACIALIS *Malmgren.*

Nord. Hafs-Ann., p. 395, pl. xxiv, fig. 65. 1865.—Ann. Polycht., p. 220. 1867.

We found but one specimen of this genus, and that without branchiæ, and otherwise much injured. Depending mainly on the setæ, we refer it with some doubt to Malmgren's species.

Sand; low water.

POLYCIRRUS *Grube.*

POLYCIRRUS EXIMIUS *Verrill.*

Torquatella eximea LEIDY. Marine Invert. Fauna of R. I. and N. J., p. 14, pl. xi, 51, 52. 1855.
Polycirrus eximius VERRILL. Invert. An. Vin. Sound, etc., p. 616, pl. xvi, *f.* 85, 1879.
WEBSTER. Annel. Chæt. of the Virginian Coast, p. 263, 1879. Of New Jersey, p. 128. 1880.

ENOPLOBRANCHUS *Verrill.*

ENOPLOBRANCHUS SANGUINEUS *Verrill.*

Chætobranchus sanguineus VERRILL. Op. cit., p. 616, 1874.
Enoplobranchus sanguineus VERRILL. Check-list (advance sheets).
WEBSTER. Annel. Chæt. of the Virginia Coast, p. 263. 1879.

Found only at Wellfleet. Sandy mud; low water; abundant.

Family SABELLIDÆ.

SABELLA (*L.*) *Malmgren.*

SABELLA MICROPHTHALMA *Verrill.*

VERRILL. Invert. Animals of Vin. Sound, p. 618. 1874.
WEBSTER. Annel. Chæt. of the Virginian Coast, p. 275. 1879. Of New Jersey, p. 128. 1880.

Not common. Found at low water.

POTAMILLA *Malmgren.*

POTAMILLA NEGLECTA *Malmgren.*

(PL. VII, FIGS. 80–84.)

Nordiska Hafs-Annulater, p. 401, pl. xxvii, fig. 84. 1865. Annulata Polychæta p. 222. 1867.

The specimens, which we refer, without much doubt, to this species, were pure white, very beautiful. The ventral sulcus, contrary to the generic diagnosis, was continued on the dorsum, although seen with difficulty in alcoholic specimens. The branchial cirri were readily lost.

Length, 60mm.

Diameter, 3mm.

Length of branchiæ, 9–13mm.

Length of first eight segments, 9mm.

Dredged in 25 fathoms; sand and shells.

POTAMILLA RENIFORMIS *Malmgren.*

Sabella reniformis LEUCKART. Archiv. f. Naturg., p. 183, pl. 3, fig. 8. 1849 (*teste* Malmgren).

Sabella oculifera LEIDY. Marine Invert. Fauna of R. I. and N. J., p. 13, pl. xi., figs. 55–61. 1855.

QUATREFAGES. Hist. Nat. des Annéles, vol. ii, p. 461. 1865.

Sabella aspersa KRÖYER. Bidrag till Sabellerne, p. 19. 1856.

Sabella oculata KRÖYER. Bidrag till Sabellerne, p. 22. 1856.

Sabella reniformis SARS. Christ. vid. Selsk. Forh., p. 123. 1861.

Sabella (Potamilla) reniformis MARION-BOBRETZSKY. Annales des Sci. Nat., vol. ii, p. 91, pl. xi, fig. 22. 1875.

Potamilla reniformis MALMGREN. Annulata Polych., p. 222, pl. xiv, fig. 77. 1867.

Potamilla oculifera VERRILL. Invert An. of Vin. Sound, p. 617, pl. xvii, fig. 86. 1874.

Potamilla reniformis VERRILL. Check-list.

We collected but one specimen of this species. Dredged in 25 fathoms; sand and shells.

OTHONIA *Johnston.*

OTHONIA FABRICII *Johnston.*

Othonia Fabricii, JOHNSTON. Lond. Mag. Nat. Hist., vol. viii, 181, fig. 19 (*teste* Malmgren and Claparède).

Fabricia Leidyi VERRILL. Op. cit., p. 619. 1874.

For the remaining synonomy of the species see Malmgren, Annulata Polychæta, p. 225. Also Claparède, Annel. Chet. du Golfe de Naples. p. 151. Malmgren's rejection of Fabricia seems to be valid, and Claparède's claim for *Othonia*, as opposed to *Amphicora*, seems equally sound; but his retention of *Fabricia* is not desirable. On decaying wood, near high water mark.

MYXICOLA (*Koch*) *Malmgren.*

MYXICOLA STEENSTRUPI *Kröyer.*

Myxicola Steenstrupi KRÖYER. Bidrag til Kunds., om Sabellerne, p. 35. 1856.
MALMGREN. Nord. Hafs-Ann., p. 408. 1865. Pl. xix, fig. 90.
Annulata Polychæta, p. 227. 1867.
Myxicola Sarsi KRÖYER. Op. cit., p. 9. 1856.
SARS. Christ. Vid. Selsk. Forh., p. 130. 1861.

Body white or yellowish white. The anterior segments, 3–6, may be brown, or white, or mottled. After the fourth segment there may be one, two, or three circular brown specks on the sides of each segment. These spots fail on a few of the posterior segments, but on the sides of the anal segment they are numerous, from four to twelve on each side, according to the size of the specimen. The branchiæ are greenish yellow at base, with their outer two-thirds reddish brown, or they may be greenish white throughhout; branchial cirri of the same color as the branchiæ.

Dredged in 25 fathoms; sand and shells.

Family SERPULIDÆ.

HYDROIDES *Gunnerus.*

HYDROIDES DIANTHUS *Verrill.*

Serpula dianthus VERRILL. Invert. An. of Vin. Sound, p. 620. 1874.
Hydroides dianthus VERRILL. Proc. Acad. Nat. Sci., p. 300. 1878.
WEBSTER. Annel. Chæt. of the Virginian Coast, p. 266. 1879.—
Of New Jersey, p. 128. 1880.

Not common. Low water, on shells, etc.

SPIRORBIS *Daudin.*

SPIRORBIS BOREALIS *Daudin.*

Very common at low water, on sea weed, etc.

Genus incertæ sedis.

We collected a single injured specimen, which we have so far been unable to refer to any described family. It presents, however, so many peculiarities that it seems desirable to describe it as far as possible.

THAUMASTOMA *n. g.*

Head rounded behind, flattened and elongated in front; without appendages. Proboscis protrusible, digitate at extremity. No jaws. First segment with median cirrus. Dorsal setæ of first segment much elongated, directed forward. Ventral setæ of first two segment in two series;

one capillary; the other stout, spinous; all other setæ capillary. Each ramus, after the first segment, furnished with a transverse plate, thin, lateral, projecting, outer margin lobed. All segments biramous.

THAUMASTOMA SINGULARE *n. sp.*

(PL. VII, FIGS. 85–94.)

Head composed of two parts; anterior two-thirds flattened (fig. 85), nearly quadrangular, slightly emarginate in front; posterior third rounded, convex, bearing two pairs of minute black eyes; destitute of appendages.

The proboscis was seen extended to a length about equal to that of the head; the incisions dividing it into lobes were observed to run back about one-half this length. In alcohol the proboscis was nearly withdrawn, showing only its anterior end (fig. 86); its inner surface was densely ciliated.

The dorsal ramus of the first segment is composed (fig. 85) of two stout, conical cirri, longer than the head; the upper of these points forward; the lower forward and outward; between their bases rise two distinct bundles of capillary setæ, which are directed forward, and reach beyond the head. The lower ramus of the first segment consists of a transverse, convex, fleshy lobe, terminating above in a short, stout, blunt, rounded process; in front of this plate are two rows of setæ; those forming the anterior series (fig. 93) similar to the posterior (fig. 92), only longer and more delicate, but still having rather the form of spines than of capillary setæ, these anterior setæ are very light colored, nearly white; the posterior series is composed of 6–8 stout yellow spines (fig. 92).

The second segment has its dorsal ramus composed of a depressed fleshy lobe (not seen in the figure, which is a front view), from which arises a fan of capillary setæ (figs. 87, 94), while in front of this lobe is a thin, projecting plate, divided along its outer margin (fig. 87) into six unequal, bluntly rounded lobes.

This lower ramus is much like the corresponding ramus of the first segment, but lacks the superior process. In this ramus is a posterior row of black spines, similar to those of the first segment, except in color, and an anterior series of very fine capillary setæ, much shorter and more delicate than the capillary setæ of the segments behind, shorter even than the spines of the same ramus. Behind the second segment all the setæ are capillary and arise from more or less well-marked rounded lobes.

On the third segment a digitated plate runs down the side of the body, in front of both rami. It has twenty-one lobes (fig. 88) along its outer margin, and runs from above the dorsal ramus to below the ventral. On the fourth segment there are two such lobes (fig. 89). After the fourth segment the dorsal lobe steadily shortens, till on the seven-

teenth segment (fig. 91) it is reduced to a single, flattened, tapering projection. Meanwhile the ventral lobe retains about the same size on all segments, but shows great irregularities in the number and depth of the incisions forming its lateral lobes. From the eighth segment the dorsal rami and setæ have an upward direction; on the eighth they are even directed inward, but as this does not occur on the segments behind the eighth, it may be due to accidental distortion; in like manner the ventral rami of the eighth segment are turned (displaced?) upward; on all segments behind the eighth the ventral setæ point directly outward, instead of obliquely downward, as on the preceding segments.

After the first two segments the setæ of both rami are much alike, but those of the dorsal rami, after the fourth segment, are much more numerous, forming a stout, closely crowded bundle.

The general outline of the body is shown in figs. 87–91, which are half segments; it is depressed with slightly convex dorsal and median fields as far back as the sixteenth segment; here the dorsum becomes more convex (fig. 91). It is possible that this change may take place somewhat more gradually than this statement would indicate, as the dorsum is somewhat injured for a few segments anterior to the sixteenth.

No color notes were made, but as we remember it the general color was dirty white.

Length of 22 segments, 15mm.

Greatest width (at twelfth segment), 5mm. This width diminishes a little forwards, the width of the first segment being 3mm.

Dredged on a sandy bottom in about 20 fathoms.

EXPLANATION OF PLATES.

PLATE I.

ETEONE CINEREA *n. sp.*

FIG. 1.—Anterior foot, × 16.
2.—Middle foot, × 16.
3.—Posterior foot, × 16.
4.—Head and buccal segment, × 16.
5.—Seta, × 300.

PODARKE CÆCA *n. sp.*

FIG. 6.—Head and anterior segments, × 70.
7.—Eighth and ninth segments, × 70.
8.—Seta, × 450.

HESIONE AGILIS *n. sp.*

FIG. 9.—Head and anterior part of alimentary canal, × 45.
10.—Foot, from middle of body, × 45.
11.—Compound seta, × 400.

PLATE II.

SYLLIDES CONVOLUTA *n. sp.*

FIG. 12.—Head and anterior segments, × 85.
13.—Outline of middle segments, × 85.
14.—Compound seta, × 750.
15.—Simple seta (acicula), × 750.
16.—Foot, × 150.

STREPTOSYLLIS ARENÆ *n. g., n. sp.*

FIG. 17.—Head and first two segments, × 65.
18.—Outline of under surface of head, × 85.
19.—Posterior segments, × 35.
20.—Foot with articulated jointed cirrus, × 85.
21.—Foot, to show ventral cirrus, × 85.

PLATE III.

STREPTOSYLLIS ARENÆ *n. g., n. sp.*

FIG. 22.—Compound seta, × 400.
23.—Simple seta, × 400.

SPHÆROSYLLIS BREVIFRONS *n. sp.*

FIG. 24.—Head and first two segments, × 130.
25.—Posterior segments, × 130.
26.—Foot with cirri, × 230.
27.—Single dorsal cirrus with double constriction, × 230.
28.—Compound seta, × 750.
29.—Simple seta, × 750.
30.—Simple seta, × 750.

PÆDOPHYLAX HEBES *n. sp.*

FIG. 31.—Head and anterior segments, × 85.
32.—Posterior segments, × 85.
33.—Anterior compound seta, × 750.
34.—Posterior compound seta, × 750.
35.—Ordinary simple seta, × 750.
36.—Posterior simple seta, × 750.

NEREIS TENUIS *n. sp.*

FIG. 37.—Head and first two segments, × 25.

PLATE IV.

NEREIS TENUIS *n. sp.*

FIG. 38.—Proboscis, ventral view, × 25.
39.—Foot from tenth segment, posterior view, × 50.
40.—Posterior foot, posterior view, × 50.
41.—Seta of dorsal ramus and upper part of ventral ramus, × 750.
42.—Seta of lower bundle, lower ramus, × 750.
43.—Seta of ventral ramus, × 750.

STAUROCEPHALUS CÆCUS *n. sp.*

FIG. 44.—Head and first two segments, × 130.
44*a*.—Lower jaw, × 130.
45.—Foot from large specimen, × 130.
46.—Seta, upper part of upper bundle, × 750.
47.—Seta, lower part of upper bundle, × 750.
48.—Seta, lower bundle, × 750.

PLATE V.

GONIADA GRACILIS *Verrill.*

FIG. 49.—Head and first segment, × 50.
50.—Anterior foot, × 85.
51.—Foot from twenty-seventh segment, × 85.
52.—Middle foot, × 85.

SPIO RATHBUNI *n. sp.*

FIG. 53.—Head and first two segments, without tentacles, × 85.
54.—Foot of second segment, anterior view, × 160.
55.—Branchiated segment, × 160.
56.—Short setæ, found sparingly in both rami, × 750
57.—Ordinary dorsal seta, × 750.
58.—Ventral uncinus, × 750.
59.—Anal cirri, × 85.

STREBLOSPIO BENEDICTI *Webster*.

FIG. 60.—Head and first segment, without tentacles, showing origin of branchiæ side view, × 130.
61.—Head, dorsal view, × 130.
62.—Fourth segment, transverse section, × 85.
63.—Posterior segments, transverse section, × 85.
64.—Posterior segments, with anal sucker, × 130.

PLATE VI.

SPIOPHANES VERRILLI *n. sp.*

FIG. 65.—Head with tentacles, × 25.
66.—Head without tentacles, × 25.
67.—Fourth segment, transverse section, × 25.
68.—Sixth segment, transverse section, × 25.
69.—Fifteenth segment, transverse section, × 25.
70.—Dorsal seta, × 450.
71.—Anterior ventral seta, × 450.
72.—Ventral uncinus, × 450.

NICOLEA VIRIDIS *n. sp.*

FIG. 73.—Anterior branchia, × 70.
74.—Uncinus, × 750.

PISTA INTERMEDIA *n. sp.*

FIG. 75.—Single branch of branchia, × 35.
76.—Long capillary seta, × 130.
77.—Short capillary seta, × 130.
78.—Anterior uncinus, × 450.

PLATE VII.

PISTA PALMATA (*Verrill*).

FIG. 79.—Anterior uncinus, × 450.

POTAMILLA NEGLECTA *Malmgren*.

FIGS. 80, 81.—Anterior capillary setæ, × 230.
82, 83.—Anterior pointed uncini, × 230.
FIG. 84.—Anterior uncinus, × 230.

THAUMASTOMA SINGULARE *n. g., n. sp.*

FIG. 85.—Head and first segment, × 15.
86.—Anterior end of proboscis, × 15.
87.—One-half of second segment, transverse section, × 15.
88.—One-half of third segment, transverse section, × 15.
89.—One-half of fourth segment, transverse section, × 15.
90.—One-half of eighth segment, transverse section, × 15.
91.—One-half of seventeenth segment, transverse section, × 15.

FIGS. 92, 93.—Setæ from first segment, × 85.
FIG. 94.—Ordinary seta, × 85.

PLATE VIII.

SPHÆROSYLLIS LONGICIRRATA *n. sp.*

FIG. 95.—Anterior part of body, × 85.
96.—Posterior segments, × 130.
97.—Foot with cirri, × 215.
98.—Long compound seta, terminal part, × 750.
99.—Short compound seta, × 750.
100.—Simple seta, × 750.

EULALIA DUBIA *n. sp.*

FIG. 101.—Head and first two segments, × 18.
102.—Anterior foot, × 50.
103.—Middle foot, × 50.
104.—Posterior foot, × 50.
105.—Seta, × 500.

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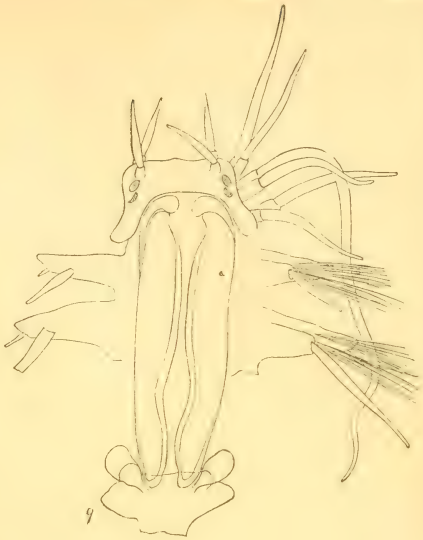
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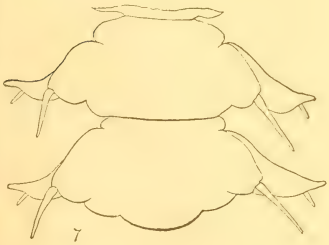
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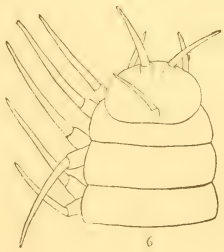
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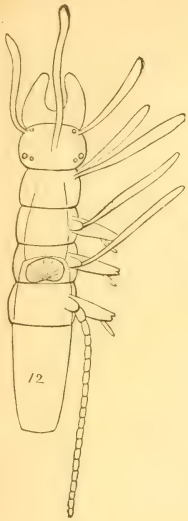
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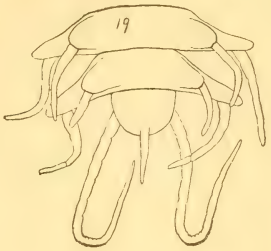
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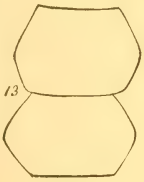
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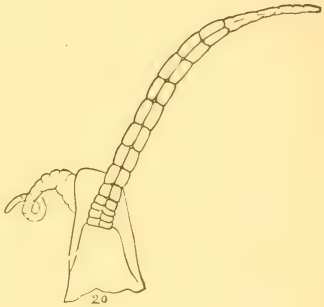
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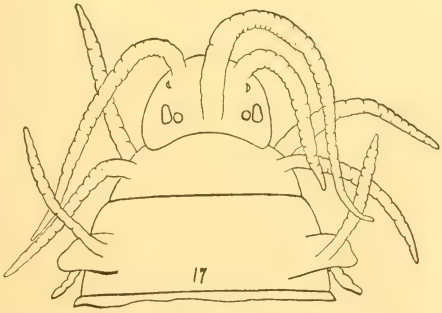
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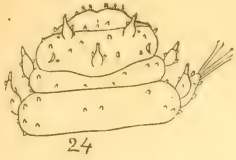
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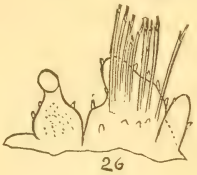
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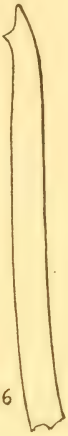
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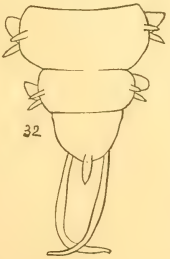
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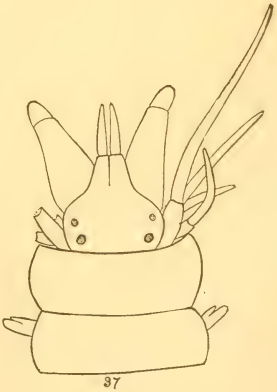
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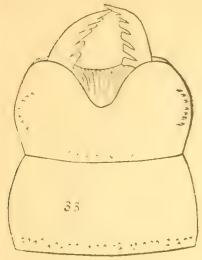
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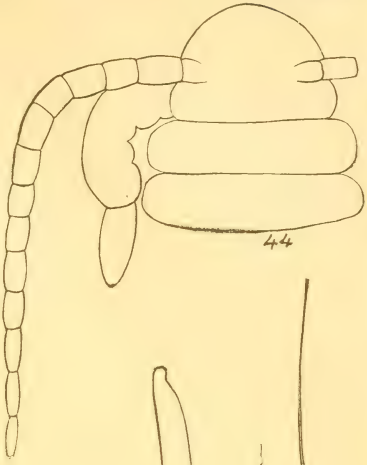
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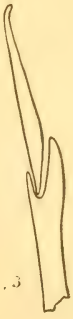
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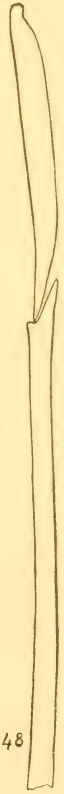
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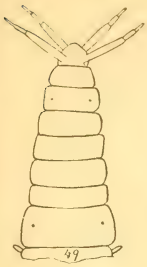
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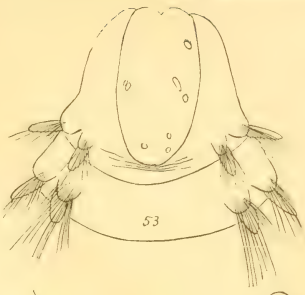
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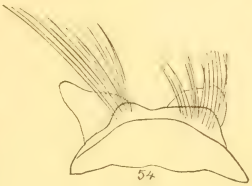
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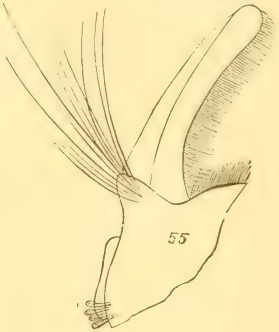
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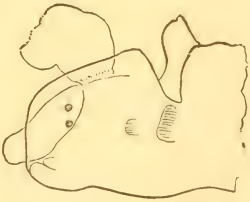

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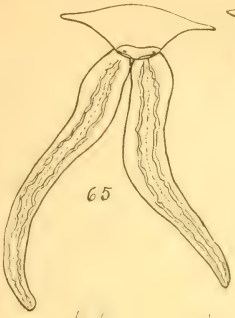
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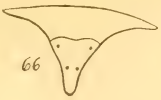
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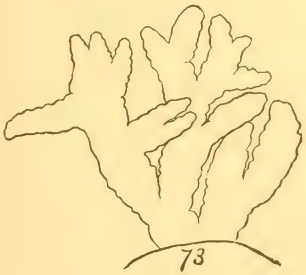
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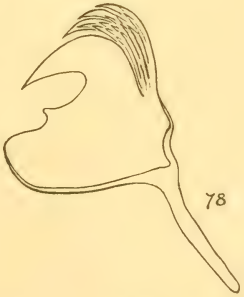
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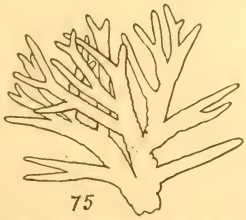
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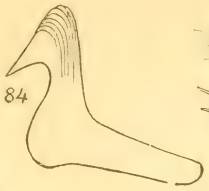
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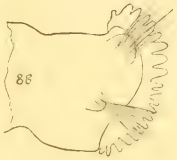
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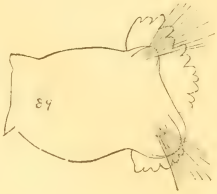
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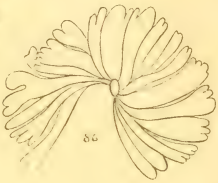
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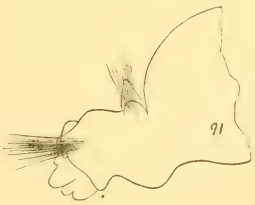
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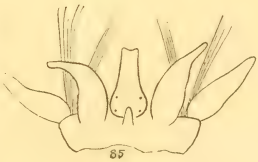
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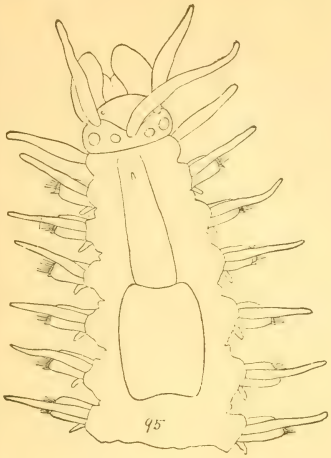
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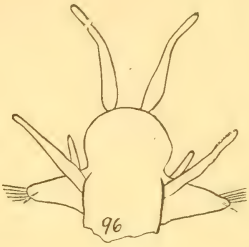
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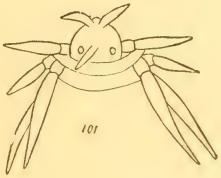
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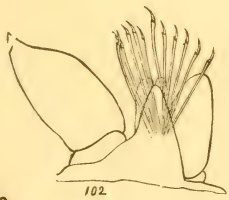
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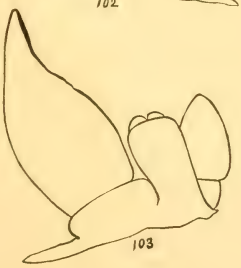
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XI.—BIOLOGICAL ACTION OF THE SALTS CONTAINED IN SEA-WATER FROM THE POINT OF VIEW OF THE MAINTENANCE OF MARINE ANIMALS.*

By H. A. Coutance.

[*Professor at the schools of naval medicine, pharmacist in chief to the Navy, and President of the Academical Society of Brest.*]

Marine animals are organisms of excessive sensibility, and are subject to the varied influences of the element in which they live. The disposition of the fauna of the sea is dependent on the composition of the salt water, the nature and quantity of the gases dissolved, and the temperature, force, and operation of the currents. The succession of species of marine animals in geological strata, little different from each other in the nature of the deposits, shows plainly that influences which appear to us but of slight importance, have governed this succession itself.

I wished to ascertain the influences which the modifications in the nature of the salts dissolved might have on the marine animals, and with this view I entered upon a series of researches for the purpose of establishing a biological parallel between these salts. My experiments have been solely devoted to the molluscs of our shores, especially those which form articles of food for our population.

The sea water contains for every 1,000 grams an average of 35 grams of different salts in solution, among which chloride of sodium appears to exercise the most important influence on animal life. The supposition is doubtless permissible that the other substances are useful to a certain limited extent, and have, apparently at least, no hurtful influence.

* "*Action biologique des sels de l'eau de mer au point de vue de l'entretien des animaux marins.*" From *Bulletin mensuel de la Société nationale d'Acclimatation de France*, 3d series, vol. X, No. 2, February, 1883. Read at the 19th meeting of the learned societies, in 1882, in general session. Translated from the French by Herman Jacobson.

I have prepared eight solutions containing 35 grams per 1,000 of distilled water, of the following substances:

Solution No. 1: Chloride of sodium	$\frac{35}{1000}$
No. 2: Chloride of magnesium	$\frac{35}{1000}$
No. 3: Sulphate of magnesia	$\frac{35}{1000}$
No. 4: Bromide of potassium	$\frac{35}{1000}$
No. 5: Ioduret of potassium	$\frac{35}{1000}$
No. 6: Chloride of potassium	$\frac{35}{1000}$
No. 7: Sulphate of soda	$\frac{35}{1000}$
No. 8: Sulphate of potash	$\frac{35}{1000}$

Here we have eight solutions, each containing one of these natural elements of the sea-water, in the proportion in which it contains all of them. The sulphate of soda alone does not belong, properly speaking, to sea-water, although its elements are contained in it.

Three other solutions have been prepared, in which all the elements are found united, but in which the quantitative preponderance which in the water of the sea belongs to the sea-salt, is given (1) to chloride of magnesium, (2) to chloride of potassium, (3) to sulphate of magnesia. The following is the composition of these solutions:

Solution No. 9:	
Chloride of magnesium	27.00
Chloride of potassium	0.75
Chloride of sodium	3.70
Sulphate of magnesia	2.30
Sulphate of lime	1.50
Bromide of potassium	0.02
Distilled water	1000.00
Solution No. 10:	
Chloride of potassium	27.00
Chloride of magnesium	3.70
Chloride of sodium	0.75
Sulphate of magnesia	2.30
Sulphate of lime	1.50
Bromide of potassium	0.02
Distilled water	1000.00
Solution No. 11:	
Sulphate of magnesia	27.00
Chloride of magnesium	3.70
Chloride of potassium	0.75
Chloride of sodium	2.30
Sulphate of lime	1.50
Bromide of potassium	0.02
Distilled water	1000.00

Another solution was composed as follows:

Solution No. 12:

Chloride of sodium	8
Chloride of potassium	8
Chloride of magnesium	8
Chloride of calcium	8

Besides these solutions, or means of experimentation, there were also employed:

Solution No. 13: Natural Vichy water (Célestins).
No. 14: Common water (springs at Brest).
No. 15: Natural sea-water (roads of Brest).
No. 16: Atmospheric air.

The Vichy water represented an aqueous element different from the sea-water, but rich in salts of soda. It was also necessary to compare the action of the artificial elements with that of the natural element, the sea-water, and to observe whether mollusks, well enclosed in their shells, could not live for some time in fresh water, or even in the air.

METHOD OF EXPERIMENTATION.—The above solutions were poured into porcelain capsules, placed in the light at an average temperature of 12°. Every two days the evaporated water was replaced by distilled water, so as to keep the solutions in the same state of concentration. Every day these solutions were strongly aërated and shaken, with the view of maintaining conditions analogous to those of sea-water. Mollusks recently caught were placed at the bottom of the capsules at a distance of 20 centimeters from the surface of the liquid.

SUBJECTS OF EXPERIMENTATION.—A very small number of species have been subjected to these physiological experiments.* They are:

The reticulated venus-shell (*Venus reticulata*).
The common mussel (*Mytilus edulis*).
The *palourde* (*Venus decussata*).
The common periwinkle (*Littorina vulgaris*).
The *buccin* of the British Channel (*Tritonium undatum*).

By reason of their different organization these mollusks have given very different results. The bivalves, mussels and venuses, which can shut themselves up between their valves, have as a general rule showed greater resistance than the opercular spiral-shelled mollusks, periwinkles and buccins. Of these the periwinkles, whose operculum can close entirely, prudently retired into the remotest coils of the spiral, and were thus better protected than the buccins, whose opening does not shut tightly, and into which the water can easily enter by the canal at the mouth of the shell.

The bivalves, which can resist external influences, whilst inclosed between their valves, do not by any means act in the same manner. In

* Oysters, subjected to the same experiments, have shown great variableness of impressions, and have generally succumbed very rapidly in the different solutions.

artificial elements the mussel resists less than the venuses; and among these latter the reticulated venus or *clovisse* shows less resistance than the palourde (*Venus decussata*), which exhibits a remarkable degree of resistance. In the solution of sulphate of magnesia, for instance, the mussel succumbed after ten days, the reticulated venus-shell after fifteen, whilst the palourde was still alive after sixty days. These proportions were very nearly maintained in the other solutions relatively to the duration of life in these mediums.

Below is given the result of these experiments as regards the palourdes (*Venus decussata*). Five specimens of this kind were on the 10th January, 1882, placed, under the same conditions, in each of the different solutions mentioned above. The same care was bestowed on all of them, and they were properly aërated every day. At the same time a certain number of these mollusks were placed, near to the former, in vessels containing natural sea-water.

January 10. Experiments commenced with the palourdes.
25. They succumbed in the ioduret of potassium.
February 10. They succumbed in the chloride of potassium.
15. They succumbed in the air.
18. They succumbed in the sulphate of potassium.
18. They succumbed in the common water.
20. They succumbed in the solution No. 10.
20. They succumbed in the bromide of potassium.
20. They succumbed in the chloride of magnesium.
25. They succumbed in the Vichy water.
22. They succumbed in the chloride of sodium.
22. They succumbed in the solution No. 12.
24. They succumbed in the solution No. 9.
March 10. They succumbed in the sulphate of magnesia.
10. They succumbed in the solution No. 11.
15. Some palourdes are still living in the sulphate of soda.
15. The palourdes placed in the sea-water are alive.

OBSERVATIONS ON THESE FACTS.—It appears from these experiments that, in spite of the possibility of shutting themselves up between their valves, the venuses yield to the action of the surrounding mediums, since their power of resistance is not equal.

Salts of potash seem much less favorable than the salts of magnesia, and especially than salts of soda. Life ceased first in the ioduret, the bromide, the chloride, and the sulphate of potassium, and in solution No. 10, the prevailing element of which is chloride of potassium.

The salts of soda and magnesia still maintained life when the animals had succumbed in the salts of potash. Solution No. 9, for instance, the principal element of which is chloride of magnesium, preserved its inhabitants alive much longer, and the same applies to the sulphate of magnesia alone and in solution No. 11.

The resistance of the palourdes in the Vichy water shows the favor-

able action of salts of soda on the preservation of life in marine animals; for forty days the palourdes lived in this mineral water!

It was in the sulphate of magnesia and the sulphate of soda that life was sustained longest, the latter excelling the former. On the 12th March I tasted some of the *Venus decussata* which had been kept in sulphate of soda for sixty days, and found their flavor excellent and without any trace of a bitter flavor. This observation might prove useful in alimentary economy, as the palourde is a highly prized shell-fish, and sulphate of soda can be bought cheap.

It is a fact worthy of remark that it was only in the solutions of sulphate of soda and sulphate of magnesia that green algæ commenced to make their appearance at the end of sixty days. The conditions favorable to marine animal life are then apt to develop vegetable life. There is nothing surprising in this parallelism, but it receives from the present circumstance a curious confirmation. One singularity appears: the solution of chloride of sodium (impure marine salt) did not sustain life as long as the solutions of salt of magnesia and sulphate of soda, and yet salt is an essential element of the sea-water. This proves that the mollusks are adapted, not to pure salt, but to that peculiar mixture which constitutes the natural sea-water; and that the secondary elements, as regards their quantity, play an important part. This gives us reason to suppose that the accidental modifications of the water of the sea during the different geological periods must have had a great deal to do with the extinction of various species.

The venus remained closed in most of the solutions, the nature of which they doubtless learned to know by opening their valves a very little. Meanwhile they occasionally put their siphons outside the shell, for instance in the sulphate of magnesia and in the sulphate of soda. In the solution of chloride of sodium and in the sea-water they had their siphons out nearly all the time.

The palourdes can live for more than a month in the air in a cool place. For about twenty days they remain shut; later they open their valves and protrude their siphons. At the least touch they draw them in and close their valves. Then comes the moment when the striped muscles which bring the valves together have no longer the strength to do this, although the smooth muscles which retain them will still do so, when one closes the valves. In all the solutions in which these mollusks have lived these same phenomena could be observed.

The weakening of the muscles showed itself first in the striped part of the adductors, which draw the valves together, and later in the smooth part of the same muscles, which held the valves artificially closed for a constantly decreasing period.*

The *Venus reticulata*, or clovisses, showed the same phenomena; the order of extinction of vitality in the different solutions was the same;

*See *De l'énergie et de la structure musculaire chez les mollusques acéphales.* [On the energy and muscular structure of the acephala.] By J. B. Baillière, Paris.

but these mollusks did not live as long as the preceding ones. They succumbed a month after they had been placed in the solutions, first in the salts of potash, then in the salts of magnesia, and finally in the salts of soda.

The periwinkles resisted longer than the bivalves, and showed less repugnance to sulphate of soda, in which they lived forty days.

The great buccin succumbs much quicker, as it cannot close its shell hermetrically like the periwinkles. At the end of twenty-four days it died in most of the solutions employed, especially in the salts of potash. Its life was prolonged forty-eight hours in solution No. 12, in the sulphate of magnesia, and in the sulphate of soda, but soon came to an end.

During all the time these experiments were going on, from January 10 to March 15, the palourdes and the periwinkles lived in the sea-water of the laboratory, the *Venus reticulata* and the mussels not quite so long, and the buccins only a few days.

It is a very important fact, to which we direct special attention, that the salts which constitute the sea-water and the different solutions which we employed gave to the water the faculty of dissolving variable quantities of atmospheric air. We proved by direct experiments that the solutions of salts of soda retain more air when agitated by it than the solutions of salts of potash. This would, therefore, prove that the poisonous character of the salts mentioned in our experiments is caused in part by the circumstance that they do not let their solutions become sufficiently aërated; their action produced asphyxia. This explains why the sulphate of potash and the sulphate of soda, neutral salts to which the mollusks are by no means adapted, act so differently upon them, the salts of potash killing them quickly and the salts of soda preserving them for some time.

From these experiments the following conclusions have been reached:

1. The saline elements of the sea-water act very differently on mollusks.

2. Every modification in the composition of the sea-water finally becomes fatal to the life of these animals.

3. Their greater or less resistance depends on their organization. Bivalves resist better than spiral shells, and in these two groups the results vary according to the different species.

4. Salts of potash are less favorable to the life of mollusks than salts of magnesia; and salts of magnesia are less favorable than salts of soda.

5. Outside of the salts dissolved in sea-water the sulphate of soda seems to possess a well-established preserving neutrality.

6. The death of the bivalves is caused by a general weakening of the muscles.

7. As the muscles can no longer either draw together or open the valves, the animal is exposed to the unfavorable or poisonous action of the element.

XII.—THE PROTOZOA AND PROTOPHYTES CONSIDERED AS THE PRIMARY OR INDIRECT SOURCE OF THE FOOD OF FISHES.*

By John A. Ryder.

In the course of observations made during the last few years the writer has been more and more impressed with the importance of the Protozoa and Protophytes as an indirect or primary source of much of the food consumed by man. This is notably true of what is known as fish and shell-fish food. As very striking instances of the truth of these propositions we need only to allude to the various edible species of the herring family, the shad, herring, and sardine, the gill-rakers of which are modified so as to enable them to strain the minute living organisms out of the water which is passed through the mouth in respiration; the menhaden or *Brevoortia*, which is of the same family and swarms along our coast, and which in its turn furnishes a large proportion of its food to the edible bluefish, and so serves this tyrant of the sea as a strainer, elaborator, and accumulator, as it were, of the minuter life of the oceanic wastes which it inhabits. The oyster, in like manner, subsisting as it does entirely upon Protozoa, Diatoms, minute ciliated larvæ, &c., reminds us forcibly that for some of the most savory luxuries of the table we are indirectly indebted to the existence of countless hosts of living marine beings which can be rendered visible only with the help of a microscope.

Comparatively few fishes appear to be able to utilize the Protozoa directly as a source of food. The most remarkable exception to this rule was first made known by Professor S. A. Forbes, of Illinois, who found the intestines of certain young suckers or *Catostomidæ* packed with the shells or tests of Difflugian Rhizopods. In the Proceedings of the Academy of Natural Sciences of Philadelphia for 1881, Professor Leidy states that upon examining two slides containing some of the intestinal contents of young *Myxostoma macrolepidotum* and *Erimyzon sucetta* submitted to him for examination by Professor Forbes he was able to distinguish the shells of six distinct species of Rhizopods or test-covered Amœboid Protozoa. The habits of the fishes in question are, however, mud-loving, and since they are provided with a more or less suctorial mouth it is easy to understand how they might readily con-

* Second edition, revised.

sume large numbers of these Protozoans where the surface of the ooze of the bottoms of the streams and pools inhabited by the fishes was favorable to the propagation and healthy existence of the former.

In order to render the vast multitude of Protozoa available as fish-food it is necessary that they be consumed by larger organisms, which in their turn may be consumed by the fishes. Upon investigating the literature relating to the food of the smaller crustaceans, especially of the Entomostraca, which enters so largely into the food supplies of most young fishes and very many adult forms, I find that the almost unanimous testimony of various observers is to the effect that these creatures are largely carnivorous, and subsist mostly upon Protozoa, or the lowest grade of animal existence. In proof of the foregoing the following extracts are here introduced.

In his Natural History of the British Entomostraca, page 6 of the introduction, Dr. W. Baird remarks: "I have no doubt that most of the Entomostraca are essentially carnivorous, and I have frequently seen specimens of *Cypris* in their turn, as soon as dead, attacked immediately by quantities of *Cyclops quadricornis*, which in a few minutes had fastened themselves upon the dead animal, and were so intent upon their prey that they were scarcely frightened away from it by being touched with a brush. In a short time the *Cypris* might be seen lying at the bottom of the vessel, the valves of the shell separated and emptied of its contents. Leeuwenhoek and De Geer not only maintain that the *Cyclops quadricornis* lives upon animalcules, but that it even preys upon its own young, a fact which I have also noticed myself. Jurine asserts that the *Cyclops quadricornis* is carnivorous from taste, and only herbivorous from necessity; while the *Daphnia pulex* he distinctly affirms lives upon animalcules. Place a few Entomostraca, such, for example, as the *Daphniæ*, *Chirocephali*, *Lynceï*, etc., in a vessel with pure, clear water and only some vegetable matters in it, and they gradually become languid, transparent, and finally die; but mix with this water some which contains numerous Infusoria, and the Entomostraca will then be seen speedily to assume another aspect. They become lively and active, and the opacity of their alimentary canal testifies sufficiently the cause of it. When, indeed, we consider the amazing quantity of animals which swarm in our ponds and ditches, and the deterioration of the surrounding atmosphere which might ensue from the putrefaction of their dead bodies, we see a decided fitness in these Entomostraca being carnivorous, thus helping to prevent the noxious effects of putrid air which might otherwise ensue; whilst they in their turn become a prey to other animals which, no doubt, serve their purposes also in the economy of nature."

"The food of the *Lynceidæ*," says Baird, "consists of both animal and vegetable matter, and while they prey upon animalcules smaller than themselves they in their turn are devoured in great numbers by insects larger than they are."

According to Pritchard the *Chyodorus sphæricus* is the choice food of a species of a fresh water *Nais* which he calls *Lurco*. "So great is the voracity," he says, "of this creature that I have seen a middle-sized one devour seven *Lyncei* in half an hour."

Referring to the *Daphniadæ*, our author again observes: "The food of these animals, according to Straus, consists of vegetable matter, and not animal; but I have found that of two groups placed in separate vessels of clear water, the one having only particles of vegetable matter placed beside them, while with the other there were also introduced infusorial animalcules, the latter were much stronger, more active, and throve better than the former."

This appears to be very strong evidence in favor of the animalcular diet of these crustaceans. Other evidence, too, of quite as convincing a character is not wanting. Those who have been in the habit of collecting quantities of microscopic material from ponds and ditches have frequently observed very large schools of Entomostraca in such places where the water as a rule is not absolutely stagnant, but where an abundance of duck-weed, fresh-water algæ of many kinds, as well as various water plants of the higher orders make a splendid nidus for all kinds of Monads and ciliated and Amœboid Protozoa. These are the places where *Cyclops*, *Daphnia*, and allies flourish inland in fresh water. The writer has also noticed them particularly abundant in the wide river flats near the mouth of the Susquehanna at Havre de Grace, where there are large areas many acres in extent which are covered with a luxuriant growth of *Potamogeton*, *Anacharis*, and *Vallisneria*, making a dense mat of delicate stems and leaves upon which countless multitudes of Protozoa may fix themselves and abide. If in rowing through such masses of aquatic vegetation one will stop the boat and stir carefully among the plants with the hand over the side, and cautiously watch the result, one will often notice that great numbers of Entomostraca have been frightened from their leafy retreats. These are the places where young shad ought to be liberated; in such places they would find an abundance of food at an early period, or as soon as they are fitted to partake of nutriment by swallowing.

Just as we find the fresh-water forms of Entomostraca take to the shelter of aquatic vegetation at the mouths of rivers, so it appears that many of the marine forms seek protection, and probably food, under cover of the fronds of marine algæ. Here is what their most recent monographer says in relation to this point: "A large number of species haunt almost exclusively the forests of *Laminariæ* which grow on rocky coasts at and below low-water mark; the fronds of *Laminaria saccharina* in particular are the favorite abode of many species." (Brady, Monog. Brit. Copep., Introd., i, p. 7.) Again, on page 9, he remarks "The washing of the fronds and roots of *Laminariæ*, which may be dragged up by means of the hooked grapnels used on many coasts by kelp-burners, often affords multitudes of Copepoda."

They appear in many cases to be surface swimmers. I have myself seen schools of several thousands of *Daphniadæ* of a greenish yellow color in the ditches south of Camden, N. J., swimming at the surface of the water at midday in the bright sunlight. In the vicinity of Woodbury, in the same State, my friend Mr. W. P. Seal has taken great numbers of a bright-red colored Copepod, apparently related to the genus *Pontella*, and perhaps undescribed. They were sufficiently abundant in some cases to impart a red tinge to the water.

Brady (Monograph British Copepoda) observes in his introduction, vol. i, page 9: "The beds of fresh-water lakes seem to be very sparsely populated with Copepoda, and as to swimming species it may, as a general rule, be said that the weedier the pool and the smaller its extent the more abundant in all probability the Entomostraca.

"Many of the marine species pass their life apparently near the surface of the open sea, and some of these, such as *Calanus finmarchianus*, Gunner, and *Anomolocera Patersonii*, Templeton, are frequently found in immense profusion, the first-named species having been said to form a very important part of the food of the Greenland whale, and it is remarkable that in the Arctic seas not only do the Entomostraca attain an enormous development in point of numbers, but also in individual size, Arctic specimens, for example, of *Calanus finmarchianus* and *Metridia armata* being many times the bulk of those taken in our own latitude." (*l. c.*)

According to H. Woodward, in his article Crustacea, Encyclopædia Britannica, the fecundity of the Copepoda is truly surprising. "*Cyclops quadricornis* is often found with thirty or forty eggs on each side, and though those species which have but a single ovisac do not carry so many, their number is still very considerable. Jurine isolated specimens of Cyclops, and found them to lay eight or ten times within three months, each time about forty eggs. At the end of a year one female would have produced 4,442,189,120 young! Cetochilus is so abundant both in the northern seas and in the South Atlantic as to serve for food to such an immense animal as the whale. They color the sea for many miles in extent, and when the experienced whaler sees this ruddy hue upon the ocean he knows he has arrived at the 'pasture of the whales.' They are to be seen in vast quantities off the Isle of May, in the Firth of Forth, during the summer months. Many Cetacea are attracted thither, and vast shoals of fish also come to feed upon them. One anomalous type of free Copepod is the *Notodelphys ascidicola*, described by Allman, which is found swimming freely in the branchial sack of *Ascidia communis*."

The writer, in passing, would remark that he has frequently met with Copepoda swimming freely in the ventral part of the branchial space of *Mya arenaria*, in which the animals were probably not parasitical or commensal, but had been drawn from without into the respiratory space of the mollusk through the incurrent part of its siphon.

In the same article as previously quoted Woodward observes: "The Cladocera are chiefly fresh water, and are distributed over the whole world. Of this order the *Daphnia pulex*, so abundant in our [British] fresh waters, is a good example. So numerous are they in our ponds in summer as frequently to impart a blood-red hue to the water for many yards in extent. In order to realize the wonderful fecundity of this and allied genera, it is necessary to realize that when a *Daphnia* is only ten days old eggs commence to be formed within the carapace, and under favorable conditions of light and temperature it may have three broods a month, or even a greater number, the larger species having as many as forty or fifty eggs at once."

The remarkable fecundity of the Copepoda explains the extraordinary abundance of the free-swimming species upon the high seas, and even bays, where vast schools of these crustaceans become, in turn, the food of vast schools of herrings, menhaden, and shad. Doubtless, the movements of these fishes on the high seas are determined by the abundance of their favorite food in various localities; that, like the whale, they seek their marine pasture of crustaceans, as argued by Möbius. Even larger forms of fishes, such as the huge basking shark (*Cetiorhinus maximus*), have their branchial apparatus adapted to capture small pelagic organisms in the same way as the Clupeoids. The prodigious numbers of herrings and menhaden is a proof of the abundance of the minute pelagic organisms upon which, with scarcely a doubt, it may be supposed they subsist. It is also not improbable that the vast schools of pelagic Entomostracans are in pursuit of still smaller protozoan prey, upon which they subsist and maintain their marvellous reproductive powers. Mosely, in his "Notes by a Naturalist on the Challenger," observes: "The dead pelagic animals must fall as a constant rain of food upon the habitation of their deep-sea dependents. Maury, speaking of the surface Foraminifera, wrote, 'The sea, like the snow-cloud, with its flakes in a calm, is always letting fall upon its bed showers of microscopic shells.'" Mosely records that he estimated, from experimental data, that it would take four days and four hours for a dead *Salpa* to fall to the bottom where the sea was 2,000 fathoms in depth. The deep-sea fauna is probably well supplied with food from such sources. The researches of Mr. John Murray, of the Challenger, fully confirm, and greatly expand the significance of the views of Lieutenant Maury in relation to the destiny of the marine foraminiferal shells. Wyville Thompson, Voyage of the Challenger, I, 210, observes: "Mr. Murray has combined with a careful examination of the soundings a constant use of the tow-net, usually at the surface, but also at depths from ten to a thousand fathoms; and he finds the closest relation to exist between the surface fauna of any particular locality and the deposit which is taking place at the bottom. In all seas, from the equator to the polar ice, the tow-net contains *Globigerinæ*." Some of these surface Foraminifera are relatively large, *Orbulina universa* being as much as a fiftieth

of an inch in diameter, and hence of a sufficient size to be preyed upon by a larger arthropod. The remarkable *Pyrocystis noctiluca*, discovered by Mr. Murray, and nearly a millimeter in diameter, is another interesting surface form, as is also the *P. fusiformis*, which is allied to it. Both are phosphorescent surface swimmers, and fall within the reach of other surface animals as a probable source of food. To these may be added the curious group of the *Challengerida*, together with the whole of the *Radiolaria*, with their siliceous shells, which, in the warmer parts of the high seas, actually tinge the surface when some of the highly-colored forms are abundant. From the surface of the mid-Atlantic the Challenger crew obtained stalked infusorians fixed to the shell of *Spirula;* also an abundance of large radiolarians. Haeckel, Monograph of the Radiolaria, says the largest living Radiolaria measure only a few lines in diameter, but most of them are much smaller, and attain scarcely a tenth down to a twentieth of a line in diameter. At Saint Jerome's Creek, Maryland, in one of its arms which is now used as an oyster park, the writer found an abundance of a fresh-water Heliozoan, not specifically distinguishable from *Actinophrys sol*. They were found in great abundance at times on the surface of the slate collectors which had been put down for the purpose of enabling the free-swimming fry of the oyster to fix itself. This raises the question whether the fresh-water protozoan fauna does not overlap the marine. The water in the situation mentioned was not simply brackish, but positively salt. In the same place great numbers of stalked and tube or test building ciliate forms of Protozoa were also found. The magnificent bottle-green *Freia producta* was found in the same locality in the greatest profusion. Sometimes several hundred might have been counted on a single square inch of the surface of oyster shells, slates, or boards, giving such surfaces a dark-greenish or speckled tint from their numbers. Very small species of nudibranchiate mollusks (*Æolis* and *Doris*) were found creeping amongst and over the forest of Protozoa, pasturing off of them. Amongst the tubes of the *Freia*, and attached to them, a small operculate *Cothurnia*, with a rich brown-colored test, was found in abundance, and, rarely, a very curious form of *Tintinnus*, with a tubular, subulate test, to the inside of which the stalk of the inhabitant was attached, at one side, about half way up from its base. The open or mouth end of the perfectly hyaline test was very strongly toothed, or serrate. The species may be named *Tintinnus Fergusonii*. Another species of *Freia* has been detected on the coast of New Jersey, by Professor Leidy, and, from a verbal description given me by Dr. H. C. Evarts, a species occurs in the vicinity of Beaufort, N. C. So abundant was *Freia producta* in Saint Jerome's Creek that I apprehend that in its free-swimming young state, previous to the time that it commenced to build its test, it afforded not an inconsiderable proportion of food to the oysters planted in some parts of those waters. Besides the *Freia* there were innumerable individuals of *Vorticella* observed. One of these had a very thick brown-

ish cuticle; but for numbers these were again very greatly exceeded by the compound stalked genera of bell-animalcules. Upon the very common alga, *Laminaria*, these were abundant, and upon the fronds of another alga, the *Grinnellia*, in three or four fathoms of water, near the middle of the Chesapeake, their number was truly astounding. In a few such places where these algæ were dredged up from the bottom, covered with innumerable colonies of protozoans, it would doubtless be much within bounds to state that there were 1,000 individual protozoan zoöids to the superficial square inch of frond surface. At this rate there would be 39,204,000 zoöids found to populate a single square rod of frond surface. Estimating the number at only 100 per square inch, which is low, and which would, I think, represent a fair average over considerable areas where the conditions of life were favorable, there would still be a stalked protozoan population of nearly four millions to the square rod. The most abundant of these compound forms was one which very much resembles *Zoöthamnium alternans*, Claparède, found on the west coast of Norway. The same form was again found in vast abundance upon algæ in Cherrystone River, near the mouth of the Chesapeake, during the season of 1881. Upon one occasion I found it in great abundance growing on the parts of the body of a *Pinnotheres* which was living in the gill cavity of an oyster, its swarmers, or young, as they were thrown off, in all probability forming part of the food supply of the mollusk.

I have been interested upon several occasions to observe that the very minute stalked, collared monads, *Salpingœca* and *Codosiga*, are frequently to be found attached to the stems of the compound colonies of bell-animalcules, or gathered about in the vicinity of the point of attachment of a single one. In such cases the monads appear to derive a benefit from the currents or vortices set up in the water by the waving of the ciliary crowns of their giant neighbors, which bring particles of food to their very doors as it were. On one occasion I found individuals of a species of *Vorticella* fixed to the egg-membrane of the ova of the cod fish at Wood's Holl, Massachusetts, as had been previously observed by R. E. Earll, and in their vicinity were several colonies of a compound stalked monad, resembling the *Dinobryon* of Ehrenberg. On another occasion I found something like *Poteriodendron* on the *Zoöthamnium* which covered a *Pinnotheres* inhabiting an oyster; but the chain of parasitism did not stop here, for on the monad as well as on the bell-animal there were rod-like bodies attached which were presumably bacteroid, as has been supposed by Stein. Stalked monads are probably much more common than has been supposed, which reminds me that I have detected the occurrence of *Rhipidodendron splendidum* in the bogs and ponds of New Jersey, a form which was described originally by Stein from Bohemia. Minute as the stalked monads are, they must live on still minuter beings, probably upon Microbia, or *Schizomycetës*, a group of fungi, now known to be the active agents in putrefactive changes

and proven in some cases to be at least the vehicles of infection in certain diseases. These organisms, which are very minute, are the first to appear in disintegrating or putrefying organic infusions. If small Protozoans, such as *Paramœcium*, are left to die in improperly aërated water, or water otherwise hurtful to them, they are, under favorable conditions, immediately attacked by these *Microbia*,* which then in their turn become an indirect source of supply of food for the grades next above them, such as the free and fixed ciliate Protozoa, which feed upon monads which have themselves fed on Bacteria or Bacillus-like organisms, and so onward the matter of life takes its upward way.

The process of swallowing of many ciliate infusorians is as peculiar as it is interesting. An opening, oftenest at one side of the body, is the mouth, from which a short blind canal passes into the soft substance of the animal's body. The rapid vibration of rows of cilia in the vicinity of the mouth creates currents which set in the direction of the throat, the lower end of which is dilated into a globular space by the force of the currents produced by the cilia, in which the particles of food are rotating in the contained water. This space enlarges gradually until eventually its connection with the throat is suddenly broken by a collapse of the walls which join the globular space with the former. In this way food-vesicle after food-vesicle is taken into the body of the animalcule, from which the creature will abstract whatever is useful and cast out near the mouth whatever is contained in the food-vesicles that is indigestible. The writer has seen the process in a number of forms, and it is not unusual to observe a dozen or more food-vesicles in the body of a single Protozoan. Many parasitic forms, however, are mouthless, such as *Opalina*, *Benedenia*, *Pyrsonympha*, *Trichonympha*, etc., where the nourishment is probably obtained from their hosts by transudation through the body-walls. In other forms again comparatively large objects are swallowed with apparent ease, judging from shells of other protozoan types which are found within their bodies. Such a form I encountered in a slightly brackish water pool near New Point Comfort, Virginia, during the summer of 1880. It was apparently a very large species of *Prorodon* of an irregular cylindrical form which had in a number of instances swallowed five or six large Difflugians, *Arcella vulgaris*, the shells of which remained within the animal to testify to the nature of the food it had been devouring. Some other mode of swallowing such large prey is probably practiced by this large ciliate, very different from the method first described. In the same pool a very

*Or *Schizomycetes*, the germs of which are abundant in the surrounding air, and from which the infection in such cases is derived. In some cases it may be observed that the body of the dead Protozoan is attacked at one side, which becomes the center of multiplication, from whence the putrefactive organism multiples by germination, gradually invading and appropriating the dead protoplasm of the organism upon which it feeds. These forms seem to have little or no power of forming living matter *de novo* from ammonia, carbonic dioxide, and water, but, like animals, appropriate pre-existing living matter, or such as has ceased to manifest vital phenomena.

peculiar form of hypotrichous Infusorian was detected, which was clearly very nearly allied to *Chilodon cucullulus* of Ehrenberg, but the dorsal, non-ciliated side of its body was not gently rounded, but flat, with a prominent crenate rim surrounding it. From this peculiarity it may be called *Chilodon coronatus.*

The mode of swallowing their food adopted by the fresh-water Rhizopods has been elaborately described in a few instances by Professor Leidy in his splendid monograph of this group, published by the Geological Survey of the Territories. Their food appears to be mainly vegetable, and consists, for the most part, of diatoms and desmids, though a ciliated Protozoan or Rhizopod was occasionally met with in the body of *Amœba.* The marine Rhizopods appear to be herbivorous as well as carnivorous, remains of both Protophytes and Protozoa having been detected in their bodies. *Vampyrella* has been described as almost parasitic upon the clustered frustules of *Gomphonema.*

Some aberrant ciliated forms, like the *Gastrotricha* and *Coleps*, are somewhat peculiar in their organization, and we know little of their feeding habits.

The *Suctoria* or *Tentaculifera*, which are abundant in some places, both in fresh and salt water, appear to be indiscriminately herbivorous, as well as carnivorous. In fresh water I have met with them infesting the back of the common water leech, *Clepsine*, the species being apparently *Podophrya quadripartita.* Of marine forms I have seen but two that I could regard as distinct from each other; the one, a very common form, is the old and well-known *Acineta tuberosa* of Ehrenberg, with two clusters of suckers. This form I have frequently seen with diatoms which it had seized and from which it was abstracting nutriment. The other form was much larger than the preceding and appears to be identical with the species described under the name *Podophrya gemmipara* by Hertwig. It has the same robust stalk, with the same close transverse annular markings, the same taper, and is similar in the form of the tentacles, which are often irregularly bearded or swollen. I was enabled to observe in part its development, which is also similar to that of the Helgoland species of the North Sea, above mentioned. They were found in great abundance on the surface of the fronds of *Laminaria*, together with the *Acineta tuberosa;* not as abundantly, of course, as the *Zoöthamnium*, but in sufficient numbers to make them a very considerable factor in the protozoan life found in the vicinity of New Point Comfort.

The majority of the free Protozoa and many Monads, such as *Noctiluca*, have scarcely been considered, but enough has been said, I think, to give some idea of the actual importance of the minute animal and vegetable life of the sea to make it clear that there is a most intimate relation of dependence existing between the lowest and the intermediate forms of life. Why is it, for example, that we should find the Copepoda so abundant among the *Laminaria* along the sea-coast? Have

we not shown that on the fronds of these algæ there exists, in most instances, almost a forest of protozoan life upon which these creatures may be supposed to pasture? We do not find the *Laminaria* itself eaten. Again, the foraminiferal and radiolarian fauna of the high seas appears to be in great measure, a surface fauna, according to the evidence of a number of investigators. This fact appears to have an important relation to the vast shoals of Copepoda observed at the surface of the sea by various naturalists and expeditions. It is not to be supposed, however, from what has been said, that the Copepoda are the only consumers of this vast array of individual Protozoa. Cross sections through the oyster, which the writer has prepared and mounted, show the tests of various genera and species of diatoms mixed among the indigestible earthy matters and sediment which has been swallowed along with the food. It is probable that the oyster swallows and digests many of its own embryos, and not improbably many embryos of such forms as Bryozoa and Sponges, besides the Diatoms, Desmids, and Protozoa which make up the most of its food. Ordinarily the contents of the stomach of the oyster are too much disorganized to learn much about what it has recently swallowed, hence we are at a great loss to know just exactly of what all of its food consists. Just so with the Copepoda; they themselves are doubtless eaten by other Crustacea, these in turn by others. We saw that *Doris* and *Æolis* pastured upon the forests of fixed Protozoa, just as *Planorbis*, *Lymnæus*, and *Physa* pasture upon the Protozoa, Algæ, Diatoms, and Desmids, in fresh water. The great abundance of Copepoda and Amphipoda is, however, the best evidence of the abundance of still smaller forms adapted to furnish them with food. What multitudes of forms besides Copepoda must largely subsist upon the Protozoa and Protophytes? Of such groups we may name the Lamellibranchs, Pteropods, Worms, Bryozoa, Porifera, and, doubtless, many Cœlenterata. Some of these, notably the Lamellibranchs, could probably not exist were it not for the numerous Protozoa and Protophytes, upon which, from necessity, they are compelled to feed.

What is true of the fauna of the sea appears to be in an equally great measure true of the faunæ of fresh water ponds, lakes, and streams. Recently I investigated some *Daphniadæ* which had been kept for some time in an aquarium; to my surprise I did not find any recognizable remains of animal food in the intestines. The latter were, however, entirely filled with a sarcode-like material, doubtless in part a digestive secretion, together with what might have in part been animal food. The vegetable food, consisting of Diatoms, unicellular Algæ, spores of Fungi, fragments of Oscillatoriæ, were so sparingly mixed with the intestinal contents that they could not be regarded as contributing much to the nutrition of the animal. The black or brown material, sometimes filling the intestine of Entomostraca, I find to consist in great part of humus, particles of quartz sand and earthy matters, which are of course indi-

gestible, being thrown out of the vent, as in *Chirocephala*, in the form of cylindrical casts.

The most valuable contribution to our knowledge of the food of the fresh-water fishes of the western United States has been made by Professor S. A. Forbes, in Bulletins Nos. 2 and 3 of the Illinois State Laboratory of Natural History, for the years 1878 and 1880. With the most painstaking care the results of a vast number of examinations are recorded. He finds that the Darters, Perches, *Labracidæ*, Centrarchoids or sun-fishes, Sciænoids, Pike, Bony Gars, Clupeoids, Cyprinoids, Suckers, Cat-fishes, and *Amia*, both the young and adults, consume large numbers of small aquatic, and occasionally small terrestrial organisms, notably the smaller Arthropods. While many of the more voracious species, both young and adult, feed on their immediate allies, the dietary of the fishes of Illinois, according to this observer, includes Mollusks, Worms, fresh-water Polyzoa, Hydrachnidæ, insects of both mature and and larval forms; Crustacea, embracing Decapods, Tetradecapods, Amphipods, Isopods, and Entomostraca of the groups Cladocera, Copepoda, and Ostracoda; Rotifera, Protozoa, vegetable matter, and Algæ. In his first paper he also gives a list of the organisms found in the stomachs and intestines of the Pirate Perches, *Gasterosteidæ*, *Atherinidæ*, *Cyprinodontidæ*, *Umbridæ*, *Hyodontidæ*, and *Polyodontidæ*. Both are accompanied by elaborate comparative tables, and, in an economical sense, are of the greatest practical importance in their bearing upon fish culture.

It has, however, been known long ago that fishes consume large quantities of small *Crustacea*, as will be seen from the following extract from Dr. Baird's work:

"That the Entomostraca form a considerable portion of the food of fishes has long been observed, and it is very probable that the quality of some of our fresh-water fishes may in some degree depend upon the abundance of this portion of their food. Dr. Parnell informs me that the Lochlevin trout owes its superior sweetness and richness of taste to its food, which consist of small shells and Entomostraca. The color of the Lochlevin trout, he further informed me, is redder than the common trout of other localities. When specimens of this fish have been removed from the loch and conveyed to lakes in other places the color remains, but they very soon lose that peculiar delicacy of flavor which distinguishes so remarkably the trout of Lochlevin. The experiment has been repeatedly tried and always with the same results. The banstickle (*Gastrosteus trachinus*) devours them with great rapidity, and I have seen two or three individuals clear in a single night a large basin swarming with Daphinæ and Cyclops, etc."

The writer would also refer to articles on the food of fishes in the Reports of the United States Fish Commission for 1872 and 1873 by Professors Milner and Smith, and to papers by Widegren and Ljungman on the Copepodan food of herring. Also a paper by Dr. C. C. Abbot in the same

report, for 1875 and 1876, on the winter habits of the fishes of the Delaware. Möbius has found pieces of Algæ, besides Shells, Snails, Crabs, and fishes in the stomach of the cod. The writer has found the stomach of the sheep's-head filled with the remains of the shells of mussels and large quantities of the slender branches of the common bright red sponge, *Microciona prolifera*, bitten off in short fragments by the incisor-like teeth of the fish, and with the red sponge sarcode partly digested out of its skeleton. It is presumed that the sponge feeds upon protozoan life, and on account of its peculiar dentary armature the sheep's-head is singularly well fitted to pasture upon sponges and thus indirectly appropriate Protozoa as nourishment. The same remark applies to the molluscan food of this fish.

In young shad from Capehart's fishery, Albemarle Sound, said to have been three weeks old, I found the remains of a number of adult *Tipulidæ*, or crane-flies, in the intestine. This reminds me that in examining the larvæ of crane-flies some years ago I was struck with the fine comb-like fringes which garnish the edges of their wide oral appendages, and which are so extended in life when the larva is in motion as to constitute a sort of basket which opens downwards and forwards apparently to strain out of the water the small organisms which constitute its food. Here again we have young shad feeding upon an arthropod which has passed its larval existence feeding in great part upon Protozoa. Westwood (Introd., ii, 511) I find makes a similar observation in regard to the larvæ of the gnat or mosquito family. He says: "The head is distinct, rounded, and furnished with two inarticulated antennæ, and several ciliated appendages, which serve them for obtaining nourishment from their food."

The fixed Tunicates are probably as dependent upon the microscopic life swimming about them in the water as the Lamellibranchs. The Barnacles in like manner, immovably fixed during their adult existence, kick their minute food into their mouths with their filiform legs, as remarked by Huxley. In *Pedicellina americana*, abundant in Saint Jerome's Creek, I have observed that there are rows of vibratory cilia continuous with those of the tentacles around the edge of the lophophore, which appear to lie in grooves, which blend on either side of the excentrically placed mouth. In this manner the microscopic food of this curious Bryozoan is conveyed in ciliated grooves to the mouth from all points of the oral disk. With these we may close our survey of the modes in which the protozoan grade of life is appropriated the smaller Arthropods, Pteropods, Polyzoa, Annelids, and Tunicates, but we must remember that upon these again the larger forms subsist, which are either food for each other or for man. As we pass in succession the larger forms, we may note the Lamellibranchiates, with this garniture of vibratory cilia covering the gills and palps, and which carry the particles of food and sediment suspended in the water used in respiration to the mouth to be swallowed. The Clupeoids and *Cetio-*

rhinus with their branchial sieves are particularly noteworthy for the perfection of the apparatus of prehension, but we must not forget that the gill-rakers of all fishes, whenever developed to any extent, probably subserve a similar function. Lastly, the right-whales, with their closely ranged plates of baleen suspended from the upper jaws, forming in reality a huge strainer or filter for the large volumes of sea-water which pass through the mouth, and from which the food of these marine giants is so simply obtained, will enable us in a measure to comprehend the importance of the minute life of the world, and its indirect but important economical relation to man.

THE FOOD OF THE YOUNG SHAD.

The periods of yelk-absorption.—In a previous paper by the writer on the retardation of the development of the shad it was stated that the yelk-sack disappeared on the fourth to the fifth day after the young fish had left the egg. Although this statement is in a broad sense true, I find upon more accurate investigation that there is a small amount of yelk retained in the yelk-sack for a much longer time. It appears in fact that there are really two periods of absorption of the yelk which may be very sharply distinguished from each other. The first extends from the time of hatching to the end of the fourth or fifth day, according to temperature, during which time the most of the yelk is absorbed. The small quantity which remains after this time is not visible externally, being contained in a small fusiform sack, all that remains of the true yelk-sack inclosed by the abdominal walls, and causes little or no visible prominence on the under side of the young fish. Viewed as a living transparent object from the side, we see it in the young fish lying below the œsophageal portion of the alimentary canal immediately in front of the very elongate liver, and behind the heart, with the venous sinus of which it appears to communicate by a narrow duct formed of the anterior portion of the yelk hyboblast, which formerly covered the distended yelk-sack. The appearances presented by the living transparent objects are fully confirmed by the evidence obtained from transverse sections of embryos from ten to twelve days old. It appears that the yelk-sack of the California salmon probably behaves in a somewhat similar manner as indicated by transverse sections. I even find this slight rudiment of the yelk-sack in shad embryos fourteen to sixteen days old, but this seems to be about the period of its disappearance. The second period of the absorption of the yelk therefore extends in the shad over about twice that of the first, or about ten days. The first period extends to the time when the yelk-sack is no longer visible externally, the second from the time the remains of the yelk-sack become inclosed in the abdomen until its final and complete absorption. The function of the yelk-sack during the first period appears to be to build up the structures of the growing embryo; during the second, not so much to build it up as to sustain it in vigorous health until it can cap-

ture food to swallow and digest, so that it may no longer be dependent upon the store of food inherited from its parent.

The appearance of the teeth.—Minute conical teeth make their appearance on the lower jaws and in the pharynx of the young shad about the second or third day after hatching. Sections through the heads of embryos show that these teeth are derived from the oral, hypoblastic lining of the mouth. There are none on the upper jaw; there are four arranged symmetrically on the lower jaw, or rather Meckel's cartilage. In the throat, in the vicinity of the fifth and last branchial arch, there are two rows of lower pharyngeal teeth, the first of six, three on a side; the last of four, two on a side. These teeth are of the same form and size as those on the jaws.

The age at which it begins to take food.—Although peristaltic contractions of the walls of the intestine of young shad may be observed soon after hatching, I have never observed food in the alimentary canal until ten or twelve days after the young fish had left the egg. At about the beginning of the second week considerable may be seen in living specimens. But the intestine is often not yet very densely packed with food even at this period. At the age of three weeks an abundance of food is found in the intestine, that portion which becomes the stomach and which extends from the posterior extremity of the liver to near the vent being greatly distended with aliment.

Upon investigating the nature of this food material we learn that it consists almost entirely of exceedingly small crustaceans, in reality for the most part of the very youngest *Daphniadæ* and *Lynceidæ;* only once did I find what I thought might be very small *Ostracoda* or *Cypridæ.* In some instances the undeveloped larvæ of *Daphniæ* were noticed. In a few cases green cellules were observed in the intestines of shad larvæ, resembling *Protococcus*, but as this material appeared to be accidental it is probably not an important element of shad food. In the young fishes the dark, indigestible remains of the food of the *Daphniæ* always remained, together with the hard chitinous parts, as long-curved cylindrical casts which preserved the shape of the intestines of the crustaceans. In one young shad, twenty-two days old from the time of impregnation, measuring 14 millimeters in length, I estimated from a series of sections through the specimen that it must have consumed over a hundred minute crustaceans.

The oldest specimens of artificially reared shad which came into my hands were some that had been overlooked in some of the hatching apparatus at Dr. Capehart's fishery in North Carolina, where they remained for three weeks after hatching. In that time they had grown to a length of 23 millimeters, or almost one inch. The air-bladder was more developed and the stomach was more decidedly differentiated than in any previous stage. In the intestines of these I found, beside black, earthy, and vegetable indigestible matter, the remains of the chitinous coverings of small larval Diptera, and the remains of a very

small adult crane-fly, besides Entomostraca allied to *Lynceus*. In these specimens the dorsal fin had the rays developed, the continuous median larval natatory folds having by this time disappeared.

The mode in which the young fish capture their Entomostracan prey may be guessed from their oral armature. Most fish larvæ appear to be provided with small, conical, somewhat backwardly recurved teeth on the jaws. Rathke, in 1833, described the peculiar hooked teeth on the lower jaw of the larvæ of the viviparous blenny, and Forbes has observed minute teeth on the lower jaw of the young *Coregonus albus*. I have also met with similar teeth on the lower jaw of the larval Spanish mackerel.

THE FOOD OF THE ADULT SHAD.

The mouth of the adult shad, as is well known, is practically toothless, and in the throat there are no functionally active teeth, as in the larvæ, so that the latter, in reality, have a relatively much better developed dentary system than their parents. The adult, moreover, probably feeds in the same way as the generality of the Clupeoids, that is to say, by swimming along with the mouth held open, as I have frequently observed is the habit of the menhaden in its native element. In this way the water which passes through the branchial filter is deprived of the small animals which are too large to pass through its meshes and be swallowed.

It is a common remark of the fishermen that it is seldom that one finds food in the stomach of the adult shad in fresh water; indeed, from personal observation, it is rare or exceptional. The writer has heard many fishermen express their belief, based on this singular fact, that this fish did not feed at all in fresh water during the spawning season. With this unreasonable opinion I cannot coincide, and I have no doubt but that the shad feeds in fresh water, as well as in the sea, upon such small animals as are liable to be captured by its prehensile apparatus. That it does probably capture large numbers of small crustacea in fresh water the following observation will show: A spawning female, captured about twenty miles from Washington, down the Potomac, when the stomach was opened, was found to contain about a tablespoonful of Copepoda, apparently a *Cyclops*, and very similar to the common fresh-water species. This is the only instance in which I found a large amount of food which appeared to have been recently captured, since the carapaces and joints of the antennæ and body were still hanging together, with the soft parts partially intact, showing that they had probably been recently swallowed and but partially digested. Upon examining the intestine, however, I invariably found the remains of Copepoda imbedded in the intestinal mucus, the most conspicuous and constant evidence of which was the presence of the hard chitinous jaws of these creatures. This was the invariable rule, even where there was no food discernible in the stomach. Besides the remains of Cope-

poda observed, there were almost invariably present in the intestine green cells, apparently of algous origin; occasionally there were also seen the remains of large crustaceans, possibly shrimps or Amphipods, but these were so mutilated and disorganized that the evidence of their presence is founded only upon the occurrence of single joints or fragments. The tests of rotifers and the shells of Diatoms of both discoidal and naviculoid forms were also observed.

Upon the foregoing facts the writer bases his conclusion that the shad does feed in fresh water.

If it were of any advantage we might speculate upon the relations subsisting between the smaller and larger aquatic and marine forms of life, but perhaps enough has been said to show that there is an extensive basis of fact to support what is implied by the title of this paper. The manifold adaptations and contrivances by which food is obtained by organisms which prey upon others, and how the tendency to accumulate the vast amount of the "physical basis of life," represented by the existing Protozoa and Protophytes is practically realized by the hordes of Entomostraca and other small animals with which both fresh and salt waters teem. How these again are accumulated in appreciable quantities so as to furnish an important source of food is shown by the immense numbers, amounting to many thousands, which may be taken from the stomach of a single fish. In the case where the large quantity of Copepoda was obtained from the stomach there were probably more than 100,000 individuals of these crustaceans, which would average a fifteenth of an inch long and a fiftieth of an inch wide. This fact will serve to show how fine the meshes of the branchial sieve must be to prevent the prey of the shad from escaping from this remarkable collecting apparatus. The soft parts, too, of the individual crustaceans were so well preserved that one could distinguish the pigment of the eyes, the muscles, and intestine with its contents, while the vast number of their eggs mixed amongst their bodies testified to the multitudes of females which had been swallowed. These facts would appear to indicate most positively that the fish had captured its food quite recently and after it had reached quite fresh water.

XIII.—THE FIRST FOOD OF THE COMMON WHITEFISH.

(*Coregonus clupeiformis, Mitch.*)

By S. A. Forbes.

In a very large lake the conditions of life are remarkably uniform. The volume of water remains, of course, constant from season to season and from year to year, and the extremes of summer heat and winter cold have but a moderate effect upon the temperature of the lake as a whole. Consequently both plant and animal life exhibit there a regularity and stability which are in remarkable contrast to their fluctuations in smaller bodies of water and on the surrounding land. Not only do the relative numbers of individuals in the various species remain about the same, but the absolute number of each must necessarily change but little, as a rule.

Such a state of affairs is eminently favorable to an exact and *economical* balance of supply and demand, of income and expenditure, of multiplication and destruction, among the inhabitants of the lake. Here every species of animal, whether predaceous or vegetarian, must find, in the surplus products of growth and reproduction among the species upon which it depends for food, a far more constant and unvarying supply for its needs than elsewhere; and the species fed upon must be subject to a far more regular drain upon their surplus numbers or unessential structures. Where there is little fluctuation there is little waste.

A system of life like this, running on with relatively even tenor for centuries, must of course be much less *flexible* than one where wide and violent fluctuation and continual readjustment are the rule; and a species in any way deeply affected will here have within itself far less recuperative power than one which has been forced again and again—each year, perhaps—to rally against the most destructive attacks as the price of its continued existence. Disturbances of the natural balance of life, of the primitive and spontaneous system of reactions by which the different groups of organisms are related, will therefore be unusually serious and lasting; and where such disturbances result from human interference, as by the yearly capture of large numbers of any important fish, it is especially desirable that artificial means of compensation be taken to restore the disturbed balance as nearly as possible. Excessive loss will be made good by natural reactions far more

slowly than if it occurred to a pond or river species, accustomed, as most of the latter are, to fill up rapidly enormous gaps in their numbers.

On the other hand, to multiply *unduly* by artificial measures any species naturally abundant in such a lake will have scarcely a less disturbing influence than to *diminish* its numbers in the same ratio. The relatively nice balance between the demand for food and food supply which here naturally obtains is such that an extraordinary increase in a species must soon react to diminish greatly its food resources—a fact which will then take effect on the species itself, reducing it below its natural original level; and if both excessive capture and excessive multiplication go on side by side we shall have this result finally aggravated to an extreme degree.

As fishes are caught before the end of their natural lives, but planted by the fish-culturist when young, it is evidently the food of the young which will be first and most seriously affected by overproduction. Only a part of the adults, perhaps a small fraction, will live a life of ordinary natural length, many being captured before they have attained even the average size: but a far greater number, perhaps nearly every one, must survive the earliest period and must consequently draw most heavily upon the earliest food resources of the species when these differ from those of the adult.

The above considerations are brought forward here to show the especial importance to us of a study of the system of natural interactions by which the animals of our great lakes affect each other, if we would avoid the necessarily injurious consequences of our own interference with the natural order there obtaining, and above all to show the extraordinary value of a knowledge of the food habits and food capital of the *young*. They apply perhaps more forcibly to the whitefish than to any other species in the lakes; because this is for several reasons the most important purely fresh-water fish of the Great Lake region, and proves to have a distinctly different food when young from that upon which it is dependent later.

According to the recent census report,* more than twenty-one million pounds of whitefish were taken in the Great Lakes in 1879, valued at over three-quarters of a million dollars, and representing nearly half the total sum derived from the lake fisheries of all kinds. These fisheries employ over five thousand men, and a fixed capital of one million three hundred and forty-six thousand dollars. When we reflect that this enormous drain upon the number of the species is necessarily, to a considerable extent, an addition to the natural tax levied upon it by its enemies other than man, we see that there must be an artificial supply provided, or the fisheries will gradually fail.

The importance of the knowledge of the food of so valuable a species needs no demonstration, especially when we consider that, consistently

*Census Bulletin No. 261, September 1, 1881.

with what has been said above, it may not be difficult to overdo the work of propagation.

If the whitefish were to be multiplied indefinitely, without any attention to the character or abundance of its food supply, it would soon reach such a number that it must infringe upon its own food capital, diminish the average number of the animals upon which it depends for subsistence, and so finally indirectly cripple itself. Then the money and labor expended in its culture would be principally lost, and the last state of the species would be worse than the first. An acquaintance with the food of the young is especially necessary, because they are planted by the fish-culturist when, having already absorbed the egg-sack (the supply of food by which they are under natural conditions supported until they have time to scatter themselves widely through the water), they are in a peculiarly helpless condition, unable to wander far in search of subsistence, and compelled to find food speedily or perish. One would say, therefore, that their alimentary resources and habits should be well and thoroughly known, that the range, period, and abundance of the organisms upon which they feed should be carefully determined, and that each locality where the young are deposited should be closely searched for the purpose of ascertaining whether their food species occur there at the time in sufficient quantity to prevent immediate starvation.

Previous studies of the food of young fishes of a variety of families, reported in the third paper of this series, had shown that, with exceptions presently to be mentioned, the earliest food of all the families studied consisted almost wholly of various species of Entomostraca and some equally minute and delicate dipterous larvæ. When that paper was prepared, I had, however, no opportunity to study the food of the young of any members of the family Salmonidæ, to which the whitefish belongs, neither could I learn that any such studies had been made by others; and I could only infer the same fact with regard to this family from the general character of the results obtained by the study of the other groups. Even this inference, however, was rendered doubtful by the discovery that the youngest individuals of two of the toothless families (Catostomidæ and Cyprinidæ) were not strictly dependent upon the food elements above mentioned, but were likewise able to draw upon much smaller organisms, namely, the minutest Protozoa and unicellular Algæ; and as the adult whitefish is likewise destitute of teeth, it was not by any means certain that their young would not fall under the latter category. Upon looking up the literature of the subject, I found that, although the food of the adult had been very well made out in a general way,* only two items had been published respecting the food of the young. In the report of the United States Fish Commission for 1872–'73, an assistant commissioner, Mr. J. W. Milner, made some experiments on young whitefish hatched artificially, sup-

* Report of the United States Fish Commission for 1872–'73, pp. 44–46.

plying them with a number of articles of food, in the hope of finding something suitable for their nourishment.

"A few crawfish," he says, "were procured and pounded to a paste, and small portions put into jar No. 1; the young fish ate it readily. They were fed at night, and the next morning every one of them was found to be dead. Jar No. 2 was supplied with bread crumbs, and the fish were seen to take small particles in their mouths; they did not die so suddenly. Jar No. 3 was supplied with sweet cream, but no evidence was afforded that the occupants fed upon it. A quantity of rain-water was exposed to the rays of the sun for the purpose of generating minute forms of life, and a teaspoonful was poured into jar No. 4, morning and evening, in the hopes that their proper food was of this character. In jar No. 5 a variety of food was provided—dry, fresh beef, milk, boiled potato, and bread. The crumbs of bread and the scrapings from the beef were all that the fish were seen to take into their mouths. They died, one after another, very rapidly, and in a few days all were dead." He further remarks: "This difficulty of procuring a suitable food for the young whitefish has been the experience of the few fish-culturists who have hatched them."

With the hope of ascertaining the natural food of these fishes, a few specimens, representing young captured in the Detroit River, and others from the hatchery, were submitted by Mr. Milner to Mr. S. A. Briggs, a microscopist, of Chicago. Four examples were examined by Mr. Briggs, two from each of the above situations. Those from the hatchery contained nothing whatever, while those from Detroit River contained numerous specimens of two species of Diatomaceæ, viz, *Fragilaria capucina* and *Stephanodiscus niagaræ*. The only fact at that time known would consequently indicate that the earliest food of the species consisted of Diatomaceæ.

The whitefish, as is well-known, lays its eggs in the open lake in autumn, the young not appearing until early in the following spring. At this cold and stormy season, in the exposed situations where they are to be sought it is practically impossible to find the young fish; a fact which rendered the study of their earliest food a subject of unusual difficulty. There seemed, in fact, no practicable way to reach satisfactory conclusions upon it except by experiment upon individuals artificially hatched.

In December, 1880, I made an arrangement, through the kindness of Professor Baird, of the Smithsonian Institution, with Mr. F. N. Clark, superintendent of the United States fish hatchery at Northville, Mich., for a supply of young whitefish to be sent me at intervals from the hatchery under his control. The specimens furnished were taken from two lots. The fishes of one lot, hatched January 18, were kept in a tank in the hatchery, where they were supplied with water from a spring, which had been cooled by exposure to the air in artificial ponds before entering the hatchery, in order to retard the development of the

fry. The ordinary range of temperature in the tank was from 35° to 39°. These fishes were fed daily with a paste made by grinding small amphipod crustaceans (Gammarus) in a mortar.

The second lot, hatched January 20, was kept, unfed, in a perforated tin box, in a rivulet flowing from a spring, about 60 feet from its source. The water had a uniform temperature of 47°.

Those in the spring, being in warmer water than the others, developed much more rapidly, and it was believed that the character and source of this water was such as to furnish them at least a small supply of such food as young fishes are accustomed to appropriate.

Ninety specimens were received from the hatchery February 9, at which time they were three weeks old. They were thirteen mm. (half an inch) in length by one in depth. The egg-sac was but partially absorbed in most of the lot, but in those most advanced was represented by an oil globule back of the head. The pectoral fins were well developed, but no trace of the ventrals had as yet appeared. The single median fin extended well in front of the vent, and forwards on the back nearly to the head. The opercles did not fully cover the gills. The most highly developed specimens—those whose gill-sacs had nearly disappeared—had, at a short distance on either side of the symphysis of the lower jaw, a sharp, strong, raptatorial tooth, curved backwards and slightly inwards. The base of this tooth was very broad, and the point acute and slender. At a point behind each of these teeth, about half their distance from each other, was a second much smaller tooth, directed almost exactly inwards. The upper jaw was, however, wholly toothless.

These fishes were all passed under the microscope, after having been rendered transparent, but only four of them contained anything whatever; three a little dirt, and the fourth a minute fragment of the crust of the Gammarus, with which they had been fed.

Of one hundred and eleven specimens received February 17, seventeen had taken food. I dissected nine of these and found fragments of Gammarus and nothing else. Ninety specimens from the same lot were examined February 25, and food was found in fourteen. Four of these had eaten Gammarus fragments; two, larvæ of gnats; one, a small Cypris, and eight contained small fragments of the leaves and stems of vascular plants, including a bit of a netted-veined leaf and a little piece of pine wood. Thirty-nine specimens, the last of the lot, were received March 15, and food was found in fourteen. I dissected nine of these, finding fragments of Gammarus in four, a larva of a gnat, a Chironomus larva, a larva of some undetermined fly, a minute vegetable fragment, a Cyclops, a Cypris, and an undetermined Entomostracan each in one. Three hundred and forty fry from the hatching-house were examined in all, in forty-seven of which (fourteen per cent.) more or less food was discernible. Of the thirty-five dissected, eighteen had eaten Gammarus

fragments; five, minute insect larvæ: four, Entomostraca, and eight, small particles of vegetation.

Only four lots were received from the spring, on the 9th, 14th, 17th, and 25th of February, after which all died of starvation. In the first hundred only one was found which had taken food, and this had eaten a trace of filamentous Algæ and a minute fragment of the parenchyma of some higher plant, with a few diatoms. But one of the second hundred contained even a trace of food, a minute quantity of some thread-like Alga, the cells of which still contained a little chlorophyll. In the third hundred likewise, food was found in but one. This consisted of a few particles of vegetable parenchyma, doubtless derived from the decaying plant structure in or around the water. In the third lot of only forty-two specimens, six showed traces of food, consisting almost entirely of a few filamentous Algæ (including a fragment of Oscillatoria) and a little vegetable parenchyma. Desmids and diatoms were observed in trivial numbers.

The total number received from the spring was two hundred and forty-two, of which but eight were found to have eaten anything (a little over three per cent. of the whole), and these had taken only Algæ and vegetable fragments.

An example of the water of the spring sent me contained many Algæ but no animals larger than rotifers. The water of the hatchery, being exposed in ponds of considerable size, afforded a better opportunity for the development of animal life, to which fact was doubtless due the occurrence of insect larvæ and Entomostraca in the intestines of the fishes reared in it. The situation of the spring, on the other hand, was particularly unfavorable, as it was under the hatchery, and consequently in the dark.

The observations above described on the specimens kept in spring water have but little value, for the reason that evidently very little food was contained in the water flowing through their cage. The vegetation in the streams being chiefly filamentous Algæ and the number of Entomostraca apparently trivial, very little of either vegetable or animal food could reach the little prisoners. It is not surprising, therefore, that, notwithstanding their greater age and the higher temperature of the water in which they were kept, a much smaller ratio of the specimens had taken food than of those captured in the hatchery. From the contents of their intestines we can only infer that these fishes, reduced to a desperate strait by starvation, will snatch at almost anything contained in the water. The result obtained by a study of those from the hatching-house was more significant, but still unsatisfactory. It seemed to indicate that in confinement whitefish fry will feed upon both animal and vegetable structures to some extent, and that they can be induced to take minute fragments of the higher crustaceans, but not in sufficient quantity to keep them alive. The fact that animal food was more abundant than vegetable in this last lot indicates nothing of their

natural preference, since it was doubtless also more abundant in the water containing them.

More light was thrown upon the earliest food habits of these fishes by the discovery of raptatorial teeth upon the lower jaw than by these dissections of their alimentary canals. All the families of fishes which I had previously studied, whose young were provided with teeth, were found strictly dependent at first upon Entomostraca and the minuter insect larvæ; while only those whose young were toothless fed to any considerable extent upon other forms. The discovery of teeth in the young whitefish, therefore, placed this species definitely in the group of those carnivorous when young. The fact that the adult was itself toothless interfered in no way with this inference, because other toothless fishes (Dorsoma) whose young were furnished with teeth had been found carnivorous at an early age.

The inconclusive character of the results thus far obtained made it necessary to attempt to imitate more closely the natural conditions of the young when hatched in the lake. In February, 1881, I obtained, through the kindness of Mr. Clarke, twenty-five specimens of living young whitefish, saved from a lot which he was planting in the waters of Lake Michigan, off Racine, Wis. I succeeded in conveying these to the laboratory without loss, and there kept them for several days in a glass aquarium and supplied them with an abundance of the living objects to be obtained by drawing a fine muslin net through the stagnant pools of the vicinity. These consisted of many diatoms and filamentous freshwater Algæ, of two or three species of Cyclops, of *Canthocamptus illinoisensis*, and *Diaptomus sanguineus* among the Copepoda, and of two rather large Cladocera, *Simocephalus vetulus* and *S. americanus*. These little fishes were kept under careful observation for several days, the water in the aquarium being frequently aerated by pouring. Many of them had, however, been injured by handling, and eleven of the specimens died without taking food. It was soon evident that the larger Entomostraca (the Simocephalus, and even the Diaptomus) were quite beyond the size and strength of these little fishes, and that only the smaller Copepoda among the animals available could afford them any food at first. These they followed about from the beginning with signs of peculiar interest, occasionally making irresolute attempts to capture them. Two days after their arrival, one of the young whitefish had evidently taken food, which proved, on dissection, to be a small Cyclops. During the next two days nine others began to eat, dividing their attentions between the Cyclops above mentioned and the Canthocamptus, and on the 22d two others took a Cyclops each and a third a Canthocamptus. One of these fishes contained still a large remnant of the egg-sac, showing that the propensity to capture prey must antedate the sensation of hunger. On the 25th the fourteenth and last remaining fish captured its Cyclops and was itself sacrificed in turn. As an indication of the efficiency of the raptatorial teeth, it may be worth while to

note that I saw one of the smallest fishes make a spring at a Cyclops, catch it, give three or four violent wriggles, and drop it dead to the bottom of the tank.

As a general statement of the result of the observations made on these fourteen fishes, we may say that eight of them ate a single Cyclops each, that one took two, and another three of the same, that one took a single Canthocamptus, that two specimens captured two each of this genus, and that finally a single fish ate Cyclops and Canthocamptus both. The final conclusion was a highly probable inference that the smallest Entomostraca occuring in the lake would prove to be the natural first food of the species.

In order to test this conclusion with precision, I arranged a similar experiment on a larger scale and under more natural conditions. Through the generosity of the Exposition Company, of Chicago, I was allowed the use of one of the large aquarium tanks in the exposition building on the lake shore, and by the repeated kindness of Mr. Clarke, of Northville, Mich., I was furnished with a much larger number of living whitefish. Five thousand fry were shipped to me in a can of water, but through unfortunate delays in changing cars at intermediate points, about two-thirds of these were dead when they reached my hands. Those living were immediately transferred to the tank through which the water, taken from the city pipes, had already been allowed to run for several hours. As this water is derived from Lake Michigan at a distance of two miles from the shore, and had at this time the exact temperature of the open lake, the conditions for experiment were as favorable as artificial arrangements could well be made.

Sending a man with a towing net out upon the lake with a boat, or upon the remotest breakwaters, immense numbers of all organic objects in the water were easily obtained. After inclosing the exit of the tank with a fine wire screen, to prevent the escape of objects placed in it, we poured these collections of all descriptions indiscriminately into the water from day to day, thus keeping the fishes profusely supplied with all the various kinds of food which could possibly be accessible to them in their native haunts. From this tank one hundred fishes were taken daily and placed in alcohol for dissection and microscopic study, to determine precisely the objects preferred by them for food. These were examined at a later date, and all contents of the intestines were mounted entire as microscopic slides, and permanently preserved. A careful study was of course made of the organisms of the lake, as shown by the product of the towing net, and when the experiment was finally ended an equally careful examination followed of the living contents of the water of the tank at that time.

These fishes, like those previously described, had already reached the age and condition at which it is customary to "plant" them in the lake. The ventrals were still undeveloped, the egg-sac had nearly disappeared, the four mandibular teeth were present, and the median fin

extended from the tips of the pectorals on the belly to a point opposite the middle of the same fins on the back. In most the egg-sac did not protrude externally, being reduced in some to a droplet of oil, but remaining in a few of a size at least as great as that of the head. The alimentary canal was, of course, a simple straight tube, without any distinction of stomach and intestine.

The sufferings of these fry in transit had doubtless weakened the vitality of the survivors, and although every care was taken to keep the water of the tank fresh and pure, about one-third of those remaining died during the progress of the experiment. The aquarium in which they were confined was built of glass, and had a capacity of about one hundred cubic feet. The temperature, tried repeatedly, stood at 42° F. A steady current of the water of the lake was maintained through this tank, entering through a rose, from which it fell in a spray, thus insuring perfect aeration.

By far the greater part of the organic contents of the water of the lake, as shown by the product of the towing-net, consisted of diatoms in immense variety, which formed always a greenish mucilaginous coating upon the inner surface of the muslin net. In this were entangled a variety of rotifers, occasional filamentous Algæ, and many Entomostraca, the latter belonging chiefly to the genera Cyclops, Diaptomus, and Limnocalanus among the Copepoda, and to Daphnia among the Cladocera.

As the Entomostraca proved to be far the most important elements of this food supply, the particulars respecting them may be properly more fully given. The smallest of all was a Cyclops, then new, but since described by me under the name of *Cyclops thomasi*.* This little Entomostracan is only .04 inch long, by .011 wide. The next in size, and by far the most abundant member of this group, was a Diaptomus, likewise new, described in the paper just cited, under the name of *Diaptomus sicilis*. This appears in two forms, one evidently young in the stage just preceding the adult. Full-grown individuals were .065 inch long by one-fourth that depth. The Limnocalanus was a much larger form, evidently preying, to a considerable extent, upon the two just mentioned. All the Cladocera noticed were *Daphnia hyalina*, an elegant and extremely transparent species, occurring likewise in the lakes of Europe. A single insect larval form (Chironomus) should likewise be mentioned in this connection, since it had about the same size and consistence of the Entomostraca, and was consequently equally available for food.

The specimens of each of the above species from a certain quantity of these collections were counted, in order to give a definite idea of their relative abundance in the lake. The Diaptomus numbered 225, the Cyclops 75, Limnocalanus 7, Daphnia 3, and Chironomus larvæ 1.

* On some Entomostraca of Lake Michigan and adjacent waters. American Naturalist, Vol. XVI., No. VIII, August, 1882, pp. 640 and 649.

It was a curious fact, however, that when the water was drawn off at the end of the experiment, more than half the Entomostraca were Limnocalanus; a fact partly to be explained by the predaceous habit of the latter, and partly by the facts relating to the food of the fishes themselves, which are presently to be detailed.

The fry were placed in the tank and supplied with their first food on the evening of the 12th of March. On the 14th, one hundred specimens were removed, and twenty-seven of these were dissected. Twenty were empty, but the remaining seven had already taken food, all Cyclops or Diaptomus. Three had eaten Cyclops only, and six Diaptomus, while two had eaten both. Fourteen of these Entomostraca, seven of each genus, were taken by these seven fishes. From those captured the next day, twenty-five specimens were examined, of which nineteen were without food. Of the remaining six, three had eaten Diaptomus and three Cyclops; five of the former being taken in all, and ten of the latter. Three specimens were next examined from those caught on the 19th of March, two of which had devoured Diaptomus and a third a single *Cyclops thomasi* and a shelled rotifer, *Anuræa striata*. The character of the food at these earliest stages was so well settled by these observations that I deemed it unnecessary to examine the subsequent lots in detail, but passed at once to the specimens taken on the 23d. Twenty-six of these were examined, and found to have eaten thirty three individuals of *Cyclops thomasi*, fourteen of *Diaptomus sicilis*, and fourteen of the minute rotifer already mentioned (*Anuræa striata*). Two had taken a few diatoms (*Bacillaria*), and one had eaten a filament of an Alga. Cyclops was found in sixteen of the specimens, Diaptomus in nine, and Anuræa in eight, only two of them being empty. The amount of food now taken by individual fishes was much greater than before, one specimen dissected having eaten two Cyclops and six *Diaptomus sicilis*, male and female. Another had taken five Cyclops, one Diaptomus, and five examples of *Anuræa striata*. Still another had eaten four of the Cyclops, four Diapotomus, and one Anuræa.

Twenty five specimens were examined from those removed on the 24th of the month, at which time the water of the tank was drawn off and all the remaining fishes bottled. Four of these had not eaten, but the twenty-one others had devoured fifty specimens of *Diaptomus sicilis*, forty-seven of *Cyclops thomasi*, fourteen of *Anuræa striata* and a single *Daphnia hyalina*, the latter being the largest object eaten by any of the fishes. A few examples of their capacity may well be given. The ninth example had eaten six Diaptomus, two *Cyclops thomasi*, and one Anuræa; the tenth had taken eight Diaptomus, two Cyclops, and an Anuræa; and the twentieth, seven Diaptomus and three *Cyclops thomasi*. In two of these examples were small clusters of orange globules, probably representing unicellular Algæ.

Summarizing these data briefly, we find that of the 106 specimens dissected sixty-three had taken food, and that the ratio of those which

were eating increased rapidly the longer the fishes were kept in the aquarium. Only one-fourth of those examined on the 14th of the month had taken food, while more than five-sixths of those bottled ten days later had already eaten. The entire number of objects appropriated by these sixty-three fishes was as follows: *Cyclops thomasi*, ninety-seven; *Diaptomus sicilis*, seventy-eight; *Anuræa striata*, twenty-nine; *Daphnia hyalina*, one. Seven of the fishes had eaten unicellular Algæ, two had eaten diatoms, and one filamentous Algæ.

From the above data we are compelled to conclude that the earliest food of the whitefish consists almost wholly of the smallest species of Entomostraca occurring in the lake, since the other elements in their alimentary canals were evidently either taken accidentally or else appeared in such trivial quantity as to contribute nothing of importance to their support. In fact, two species of Copepoda, *Cyclops thomasi* and *Diatomus sicilis*, are certainly very much more important to the maintenance of the whitefish in this earliest stage of independent life than all the other organisms in the lake combined. As the fishes increase in size, vigor, and activity they doubtless enlarge their regimen by capturing larger species of Entomostraca, especially Daphnia and Limnocalanus.

A few words respecting the relative abundance of these species at different seasons of the year and their distribution in the lake will have some practical value. We may observe here an excellent illustration of the remarkable uniformity of the life of the lake as contrasted with that of smaller bodies of water already referred to in the introduction to this paper. While in ponds minute animal life is largely destroyed or suspended during the winter, the opening spring being attended by an enormous increase in numbers and rate of multiplication, in Lake Michigan there is but little difference in the products of the collecting apparatus at different seasons of the year.* There is a slight increase in the number of individuals during spring and early summer, but scarcely enough appreciably to affect the food supply of fishes dependent upon them. They are not by any means equally distributed, however, throughout the lake, my own observations tending to show that there are relatively very few of these minute crustaceans to be found at a distance of a few miles from shore, and that in fact by far the greater part of them usually occur within a distance of two or three miles out. Indeed, the mouths of the rivers flowing into the lake are ordinarily much more densely populated by these animals than the lake itself, as has been particularly evident at Racine and South Chi-

*For definite assurance of this fact, I am indebted less to my own observations (which are, however, consistent with it as far as they go) than to the statements of B. W. Thomas, esq., of Chicago, who, while making a specialty of the Diatomaceæ of the lake, has collected and studied all its organic forms for several years, obtaining them from the city water by attaching a strainer to a hydrant many times during every month throughout the year.

cago. Neither are they commonly equally distributed throughout the waters in which they are most abundant, but, like most other aquatic animals, occur in shoals. In the deeper portions of the lake many species shift their level according to the time of day, coming to the surface by night, and sinking again when the sun is bright.

These facts make it important to the fish-culturist that the particular situation where it is proposed to plant the fry should be searched at the time when these are to be liberated, to determine whether they will find at once sufficient food for their support. A little experience will easily enable one to estimate the relative abundance of the Entomostraca at any given time and place, and they require nothing for their capture more complicated or difficult of management than a simple ring net of cheese-cloth or similar material, towed behind a boat. This may be weighted and sunk to any desired depth, so that the contents of the water either at the surface or at the bottom may be ascertained by a few minutes' rowing.

In conclusion, I wish again to express my great obligation to the United States Fish Commissoner, Prof. S. F. Baird, and to Frank N. Clark, superintendent of the United States hatchery at Northville, Mich., through whom, as already stated, the specimens were derived upon which these studies were made. My best thanks are also due to the Exposition Company of Chicago, and especially to their secretary, the Hon. John P. Reynolds, for the use of a tank in the Exposition building, and for many courtesies received while the experiment there was in progress.

XIV.—REPORT OF EXPERIMENTS FOR DETERMINING THE SMALLEST AMOUNT OF WATER IN WHICH YOUNG SHAD AND EGGS CAN BE KEPT.

By Frank N. Clark.

June 8, 1880, I was requested to conduct a series of experiments at the shad-hatching station at Washington navy-yard, and to use as small a quantity of water as possible both for the eggs and young fish. I accordingly arranged one of the cones with an aërator attachment for Experiment No. 1.

June 9.—In the morning I placed in Cone No. 1 a portion of the eggs taken the evening before (125,000), and also placed in Cone No. 2 the same number. I commenced on Cone No. 1 by running 35 gallons of water per hour. On Cone No. 2 there were 218 gallons per hour. The aërator attached to No. 1 was doing the same work the larger amount of water was doing in Cone No. 2. In the course of the day I reduced the amount of water in Cone No. 1 to 23 gallons per hour, and found the eggs had equally as good a motion as with the larger amount of water. The motion of eggs in Cone No. 1 was considered as good as in No. 2.

June 10.—Eggs were examined in both cones and found to be equally as good in Cone No. 1 as in No. 2.

June 11.—Eggs were examined in both cones. In Cone No. 1, with aërator attachment, I found more fungoid growth on the unimpregnated eggs than in No. 2. They were, however, kept free from the good eggs by the force of air and water. In cones of eggs I have worked for the last few years I have frequently found eggs with the fungoid growth to attach themselves to the good eggs. It was especially so when the water was quite warm. I have always found it necessary in such cases to add a greater flow of water.

June 12.—The fish were all out and appeared in as healthy a condition in Cone No. 1 as in No. 2. So far I have been unable to note any difference in the eggs or in their hatching other than is mentioned in this report. In the evening of this day I removed 25,000 fish from each cone, leaving 75,000 in each of the cones, with same amounts of water (23 and 218 gallons). I find the fish in Cone No. 1 are not forced against the perforated tin edges as in Cone No. 2. Accordingly it is not necessary to attend to them as in No. 2, where it was absolutely necessary to brush the fish away from the edges at least once in an hour to keep them from filling the perforated tin and running over the top of the cone. This I think one great advantage.

June 13.—Fish were examined; found them equally as good in No. 1 as in No. 2. The force of air in Cone No. 1 seems to be rather violent

for the fish. I took the wire cloth from bottom of cone. It made a slight change in the air-bubbles, they were in finer particles.

June 14.—The fish appeared in a healthy condition. At 12 m. I arranged one of the cylinder cans with an aërator attachment for conducting air and water to the bottom of the can. The water and air passed down through the pipe, and the overflow was through fine perforated tin at the top of the can into the overflow chamber, where the water passed out.

After arranging the can I immediately put into it 50,000 young shad 48 hours old. It had not been running more than ten minutes before I discovered fish were running out the overflow in consequence of the perforated tin at the overflow being too small a surface. I immediately removed the fish and informed Major Ferguson of what had occurred, and gave him my idea of what was wanted for the can. He had the cover of the can made with a larger surface of perforated tin, and this, after putting the 50,000 fish back in the can, I found held the fish.

June 15.—In the morning I discovered the fish in Cone No. 1 appearing weak, in consequence, as I thought, of the violence of air and water forcing them to top of cone, where the air-bubbles would break and throw the fish to one side. In the course of the day I found the fish were dying. In the can, which I shall designate as No. 3, I drew from the bottom of the can about 50 dead fish. The balance of the fish were looking well.

June 16.—There was a thorough examination made of all the different experiments. The fish in cones were found to be in about the same condition as the day before. The can, however, I did not find the same. During the night there had been a stoppage of the water, in consequence of which the fish were found all dead.

June 17.—The fish in Cones Nos. 1 and 2 were five days old. In Cone No. 1, with aërator attachment, the fish were dying quite fast. My opinion is still the same, that the violence of air-bubbles is too severe for the young fish, and weakens them or wears them out.

June 18.—I arranged another cone (No. 4) with aërator attachment, and immediately placed in it 100,000 eggs taken the evening before. There was an effort made to use a smaller quantity of water on this cone, but without success. As soon as the water was reduced below 23 gallons per hour the aërator would not take in air. Thus it will be readily seen the aërator will not supply the quantity of air with a less amount of water than 23 gallons per hour. This lot of eggs was examined from day to day until all were hatched, and nothing of note occurred different from No. 1.

June 19.—This morning I found the fish in Cone No. 1 all dead. The probable cause was the violence of water and air. The fish in Cone No. 2 were still doing nicely. They were turned loose in the Potomac at 6 p. m. There were 40,000 young shad put in Can No. 3 to again try the aërator. The fish in Can No. 3 did very well until the third

day, when I found them dying very fast, probably from the impure water caused by the can being closed.

June 22.—I arranged Cone No. 1 with the aërator attachment, and put in 125,000 eggs taken the evening before. The same amount of water, 23 gallons, was used on this occasion as on the others. Cone No. 4 all hatched and appeared in a very healthy condition. Out of the lot of eggs in Cone No. 4 there were about 90,000 fish, making a very good percentage. I took one-half of these fish and put them in Can No. 5, running a smaller quantity of water than on any of the other cones. There was no aërator attached to this cone. There were 18 gallons of water per hour running in this cone. These cones were kept running and were examined from day to day until June 25, when the fish were deposited in the Potomac in good condition.

June 26.—On this morning I found the eggs in Cone No. 1 all hatched. The eggs had been examined from day to day; found to be about the same as the cones hatched before. On this day I was directed to discontinue operations at the navy-yard station, to move what fish I had on hand, about 100,000, to the Smithsonian Institution, and to continue my experiments there. The young fish were moved to the Smithsonian on the morning of June 27, where they were placed in cones and cans. In Cone No. 1, with aërator attachment, I placed 20,000; in Cone No. 2, 20,000; in Can No. 1, with aërator attachment, 20,000; the balance were placed in Can No. 2. My experiments consisted of one cone with aërator attachment, running 23 gallons of water per hour; Cone No. 2, with no attachment, running 15 gallons of water per hour. This was afterwards reduced to 10 gallons per hour. In Can No. 1 I ran 15 gallons per hour until the rubber hose conducting the water burst, during the night of June 27, when, of course, the fish all died. In Can No. 2 there was no change of water during the night. The next morning I found the fish all dead. The cones were examined from day to day, and at this writing, July 3, the fish in Cone No. 1 are nearly all dead. The fish in Cone No. 2 are looking well. They are seven days old to-day.

From my experiments I have come to the following conclusions:

When a small quantity of water is to be used in hatching it is absolutely necessary to use the aërator to introduce the air with the water at the bottom of cones in order to give the eggs the motion desired. In every case where the aërator was in use, and they were kept until the fifth day, they commenced dying, and in twenty-four or forty-eight hours all were dead. My opinion is that the violence of air-bubbles and water weakened or wore them out. When it is desired to keep the fish in cones for any length of time, and to use a small quantity of water, I should advise that a small quantity of water be run in the cone, as when it is desired to use a limited supply of water a smaller quantity can be used than with the aërator. In every case the experiment tried with the can in which no change was given the fish proved disastrous in from six to ten hours, according to the quantity of fish in the cans.

WASHINGTON, D. C., *July* 3, 1880.

Record of temperature observations made at Washington, D. C., from June 9, 1880, to July 3, 1880, by Frank N. Clark.

Date.	Cone No. 1.			Cone No. 2.			Cone No. 3.			Cone No. 4.			Cone No. 5.		
	8 a. m.	12 m.	6 p. m.	8 a. m.	12 m.	6 p. m.	8 a. m.	12 m.	6 p. m.	8 a. m.	12 m.	6 p. m.	8 a. m.	12 m.	6 p. m.
1880.															
Wednesday, June 9	72	74	74	72	73	74									
Thursday, June 10	73	74	75	72	73	73									
Friday, June 11	74	75	76	73	73	74									
Saturday, June 12	75	76	77	73	74	75									
Sunday, June 13	76	77	78	75	75	75									
Monday, June 14	76	77	78	75	76	76									
Tuesday, June 15	76	76	77	74	74	74	74	75	75						
Wednesday, June 16	75	76	77	73	74	74	(*)	(*)	(*)						
Thursday, June 17	76	77	78	73	74	75									
Friday, June 18	76	78	79	74	75	76				74	76	77			
Saturday, June 19	76	(*)	(*)	74	74	75	†74	†75	†76	75	76	77			
Sunday, June 20				(‡)	(‡)	(‡)	75	76	77	76	77	77			
Monday, June 21							75	77	78	75	77	78			
Tuesday, June 22	†75	†76	†77				76	(*)	(*)	76	77	78	75	77	78
Wednesday, June 23	76	77	78							75	77	78	75‡	77	78
Thursday, June 24	75	76	77							75	77	78	75	76	77
Friday, June 25	76	77	77							75	76	77	76	77	77
Saturday, June 26	76	77	78							(‡)	(‡)	(‡)	(‡)	(‡)	(‡)
Sunday, June 27	76	75	75		75	75		75	75						
Monday, June 28	75	76	76	75	76	76	75	(*)	(*)						
Tuesday, June 29	75	75	76	75	76	76									
Wednesday, June 30	75	76	76	75	76	76									
Thursday, July 1	76	76	76	76	76	76									
Friday, July 2	75	76	76	75	76	76									
Saturday, July 3	74	75	75	74	75	75									

NOTE.—The cones were moved to the Smithsonian Institution Saturday evening, June 26.

*Fish all dead. †New eggs. ‡Fish released.

XV.—EXPERIMENTS UPON RETARDING THE DEVELOPMENT OF EGGS OF THE SHAD, MADE IN 1879, AT THE UNITED STATES SHAD-HATCHING STATION AT HAVRE DE GRACE, MD.

By H. J. Rice, Sc. D.

The report hereby submitted gives somewhat in detail the methods and results of the experiments in retarding the development of impregnated shad-spawn which were carried on by Mr. F. N. Clark and myself during the month of June, 1879, at the United States Fish Commission barges, near Havre de Grace, Md. These investigations were instituted principally for the purpose of ascertaining the possibility and practicability of transporting shad-spawn across the ocean, with a view to introducing American fish into European waters, and all of our efforts were made with that end in view. Normally, as is well known, or as is generally considered at the present time, shad-spawn requires for its development a constant although slight motion, and a continuous exchange of fresh water. Under these conditions, whether produced naturally or artificially, the spawn after impregnation will proceed in its development, and the young shad come to maturity, quickly or slowly according to the temperature of the water in which they are placed. With a temperature of 68° to 74° the ova will hatch out in from three to five days. If the water is of a lower temperature, or about 56°, the development will be much prolonged and the hatching take place in about eleven days. Upon an ocean voyage the great difficulty to be surmounted would be the lack of fresh water. Motion can be given to the eggs, and the temperature can be kept at any point which may be desired by means of ice, but all the water used with the eggs must be such as can be taken on board at the beginning of the trip.

The questions to be answered, then, in regard to a shipment of the kind proposed were, "Can shad ova be carried, and will they go on in their development, in stagnant water, or in water which, although changed as often as thought necessary, is not absolutely fresh; or can they be carried in some other manner, as for instance in an ice-chest, as is done with some other kinds of fish-spawn, as that of the white-fish of the Great Lakes for example?" It is quite evident that if it could be shown to be possible, even with considerable care, to carry shad-ova in either of these ways, it would not be very difficult to transport any quantity which might be desired to the other side of the Atlantic, and

thus introduce there a species of fish which upon this side of the water is considered one of the table delicacies of the season. We began our experiments by endeavoring to solve the second question first. For this purpose an ice-chest was constructed under the supervision of Mr. Clark. It consisted of a covered wooden box (Fig. 1, *a*) about 3 feet in each dimension, within which was a second box or well, *b*, of about one-half the size of the outer one. This well opened upon one side of the chest by a box-door, *c*, about 5 inches in thickness, and so arranged with slats, 1, 2, 3, 4, upon the inside that a large or small quantity of ice could be packed in it. The well was free from the other sides of the chest all around and on top by a space of about 8 inches, and beneath it was a drawer *d*, of about 6 inches in depth. The well could thus be entirely surrounded with ice, and the temperature regulated by the amount of ice placed in the chest, and by more or less completely closing the door of the well and the cover of the chest. In practice it was found that with a small amount of ice around the sides of the well and in the drawer and door, and a large cake upon the top of the well, an even and moist temperature could be maintained throughout the chest with very little trouble.

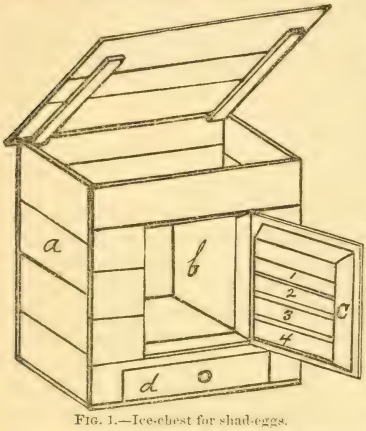

FIG. 1.—Ice-chest for shad-eggs.

FIG. 2.—Tray for ice-chest.

Within the well a series of trays (Fig. 2) were placed one above the other. They were made with wooden frames about 1 inch in thickness, and were covered upon the bottom with cotton-flannel. When wanted for use the cotton-flannel bottom of the tray was thoroughly moistened, and about 7,000 to 8,000 freshly impregnated eggs placed upon it and carefully spread out with a feather. The temperature of the eggs was then lowered very gradually until it was the same as that of the well of the chest, the chest having previously been partially filled with ice. The tray was then placed in the chest and kept at a uniform temperature during the time of the experiment. The first lot of eggs was placed in the chest on the evening of the 7th of June. This lot consisted of about 25,000 eggs which were taken fresh from the spawners and distributed upon three or four trays. The temperature was reduced very gradually to 37° when they were placed in the well, and kept at 37° and 38° until about 8 o'clock p. m. of the 9th of June. At this time they appear to be all dead, and the temperature was allowed to

rise to 55° which was about 10 o'clock p. m. same date, when a second lot of freshly-taken eggs, of about the same number as the first, was placed in the chest.

The temperature was then allowed to sink to 48°, and kept there, not running below 47° nor above 49°. About 10 a. m. of the 12th the eggs of the first lot were found to be all dead and were thrown away, but those of the second lot appeared to contain some good ones, and one trayful was placed in a cone of fresh running water at a temperature of about 75°. On the third day after, or on the 15th of June, about 20 or 30 young fish hatched from this lot.

At 12 m. of the 12th, after the trayful of eggs had been transferred to the cone, a third lot of eggs was placed in the chest. These eggs had been taken on the night of the 11th and kept in a cone of fresh running water until the segmentation cap had entirely covered the yelk and the young fish could be seen as a dark band along the side of the vitellus. The temperature was now allowed to sink to 43°, and kept at about 45° until 6 p. m. of the 14th, when all the eggs of both second and third lots were found to be dead. Forty three degrees is thus undoubtedly too low a temperature for shad-spawn; otherwise we ought to have had some live eggs in either the second lot, which furnished live ones at 48°, or in the third lot, which had been subjected to the low temperature for only about two days. On June 17th, 10 p. m., a fourth lot of freshly-taken eggs was placed in the chest, where the temperature showed 64°, and on the 20th a fifth lot was consigned to the well. In these latter ova the young fish were so far advanced as to show the eyes, protovertebræ, ear-cavity, and the heart as a single-chambered pulsatile organ. When these were placed in the chest the temperature was 55°, and it was kept at this point until the 23d, when both eggs and young fish were found to be dead. In order to keep the temperature at 55° or 56° very little ice was necessary, and it is possible that the eggs did not have moisture enough to maintain them in good condition, since they appeared to melt down into a mat-like mass after being in the chest for a day or so. This was not noticed, or but very slightly, in the other cases. Our only success, or partial success, with the ice-chest, then, was with that portion of the second lot of eggs which was kept at a temperature of 48°. The young fish which were hatched from these eggs were exceedingly vigorous and hearty, and when we broke camp on the 24th, or nine days after they had escaped from the eggs, they were about five-eighths of an inch in length, with the rays of the dorsal, anal, and caudal fins well advanced, the end of the notochord turned up very prominently, and the caudal fin slightly forked. They were about one-third larger than some older fish which were in another cone and which had been hatched out in the ordinary manner. In the stomachs of all of these young fish I found a great many shells and remains of daphniæ and other small animals, and saw them, and especially the older ones above mentioned, eat the dead of their own species.

The trials which we have thus made seem to indicate that it is impracticable to carry shad-spawn in an ice-chest, as can be done with many kinds of spawn, especially such as is laid in the fall or winter season. But it is possible that more trials and greater precautions are necessary before we can be positive in this respect, particularly as I am informed that Mr. Welcher, now of the Michigan fish commission, has kept shad-spawn in an ice-chest for a considerable time, and afterwards hatched out

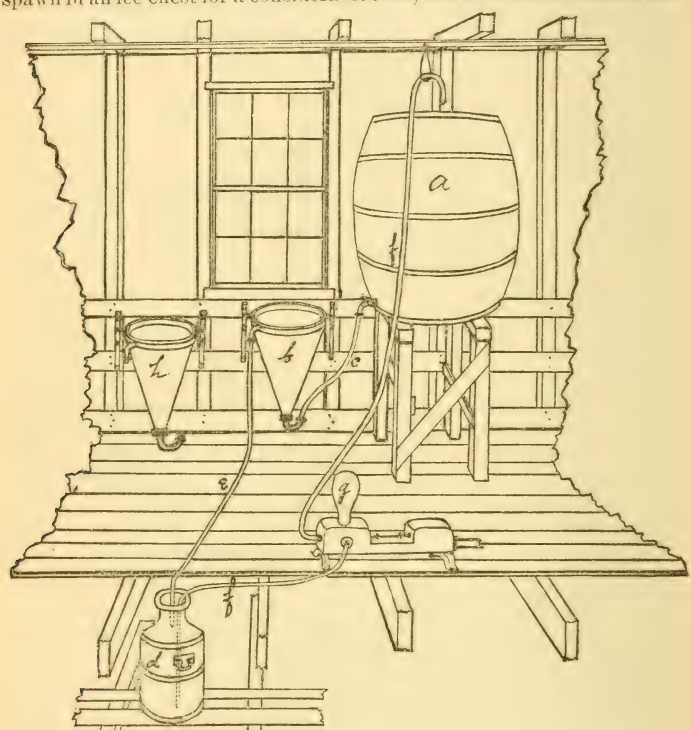

FIG. 3.—Apparatus for using the same water over again in hatching shad.

young shad from such spawn. I am not conversant, however, with his method, nor do I know to what extent he was successful in such experiments. But judging alone from our efforts, the results seem to show that an ice-chest is seriously detrimental to the integrity of shad-ova. So far, then, as our experiments have been carried, and as regards the ice-chest, the question would have to be answered in the negative.

Our second set of experiments were then begun for the purpose of test-

ing the feasibility of using the same water over and over again when its temperature is kept below the normal condition.

Our apparatus, Fig. 3, as arranged for these experiments, consisted of two reservoirs, a hatching-cone, and a steam-pump, and their connections. The first or supply reservoir (Fig. 3, *a*), was a small hogshead elevated about three feet above the floor or just above the level of the hatching-cone *b*, which was of the ordinary pattern, with a rim of wire sieving around the inside at the top with a gateway in it for the purpose of letting dead eggs pass off into the gutter, which ran around the top of the cone outside of the sieve rim and so into the escape-pipe. The cone was swung on braces attached to the side of the wall, and was connected with the supply tank by means of a rubber pipe, *c*, passing from the bottom of the reservoir to the bottom of the cone. The second reservoir, *d*, was smaller than the first, and was placed under the floor and below the hatching-cone with which it communicated by means of an escape-pipe, *e*, passing from one side of the gutter at the top of the cone down and over the edge of the reservoir can.

The apparatus was completed by placing the two reservoirs in communication by means of a long tube, *f*, passing through the steam-pump *g* and entering the top of the first reservoir. Water being placed in the large reservoir a flow would take place into the cone, and the cone when full, would overflow into the second reservoir, from whence the once-used water could be pumped back by the pump into the supply-tank, again to run its circuit through the cone. In this manner we had a constant flow of water in our cone, and as the end of the escape-pipe from the cone into the lower reservoir and that of the supply-pipe from the pump into the supply-tank were considerably above the level of the water in their respective reservoirs, there was also a slight amount of aëration from the falling water.

The temperature of the water was regulated by keeping ice in greater or less quantity in the supply-reservoir. Our first trial of this apparatus was begun on the evening of June 8. The supply-reservoir and cone were filled with water from the bay and 50,000 freshly-taken eggs placed in the cone. The temperature of the water was reduced to 45°, then allowed to rise to 52°, and kept at that temperature until the morning of the 11th, when the eggs were found to be dead and were thrown away, and the apparatus thoroughly cleaned. It is probable that the low temperature of the water had its effect in destroying this lot. At 10 a. m. of the 12th the reservoir and cone were refilled and a second lot of eggs placed in the cone. The temperature was 67°, and was gradually reduced to 56°, and kept for the most part at that point, although on the 15th it rose to 64°, for lack of ice, consequent upon our change of locality, but was brought back to 56° on the 16th. These eggs had been taken on the night of the 11th and kept until 10 a. m. of the 12th in fresh running water, at 77°, before being placed in the cone. When placed in the cone the segmentation cap entirely covered the yelk, and the young fish, as was the case with lot No. 3 which was

placed in the ice-chest, could be seen as a dark band around one side of the yelk. These eggs continued their development, or at least a goodly proportion of them did, up to the middle of the fourth day, when they were well developed, showing eyes, protovertebræ, ear-cavity, and the heart as a single-chambered pulsatile organ. They appeared to be healthy and in good condition; but gradually the water became filled with sloughs and decomposing animal matter, and early in the fifth day, or by the morning of the 17th of June, the fish were all dead. The eggs were accordingly thrown away and the apparatus again cleaned and placed in readiness for a third trial.

It had become pretty evident that the trouble was in the water, and we determined to try the next time the effect of more thorough aëration upon it. Accordingly at 10 p. m. of June 17 a third lot of about 50,000 eggs was placed in the cone, with the water in the supply-reservoir at 72°. By 7 a. m. of the 18th the temperature had been brought down to 64°, and by 12 a. m. to 53°. It was kept thereafter during the trial at an average of 54°. At intervals of two to three hours after the water had commenced running, the water in the supply reservoir and that in a second cone, Fig. 3, *h*, which had been arranged to receive the outflow of the first before the water passed into the second reservoir, was thoroughly agitated for five to ten minutes. This was accomplished by the use of a dipper, running the dipper down deep in the vessels and getting the water from near the bottom, then lifting the dipper high above the vessels before pouring it back, so as to give the water as much of a fall as possible. In addition to this method of purifying the water a certain quantity was taken two or three times each day from the surface of the hatching-cone. In this manner it was intended to take of that water which had just passed over the eggs about the same quantity that would be added to the supply-tank as fresh water by the melting of the ice, and in taking it from the hatching-cone any sloughs or dirt which had accumulated around the top of the cone could be included. Under this treatment the eggs progressed in their development and appeared in fine condition up to the middle of the fifth day, or one day longer than those of the second lot. At this time they were at the same stage of development as the second lot upon the fourth day; but it is to be borne in mind that the second lot was started in warmer and fresh water before being placed in the cone, while these passed through their entire development in the stale water. On the afternoon of the fifth day the water, despite the constant aëration, began to have a rank, fishy odor and to foam slightly in the supply-reservoir. Notwithstanding this the eggs appeared in a good and healthy condition. On the morning of the sixth day, however, or the 23d of June, the foam on the water was very considerable in amount and the eggs were quite noticeably affected. As much of the water as could possibly be spared was then taken off through the hatching-cone, together with as much of the slough and dead material as could be separated from the good eggs, and a filter of charcoal placed under the supply-tube of the supply-

reservoir. But this did not seem to stop the death of the eggs, and in order to save the remainder they were transferred at noon of the sixth day to a cone of fresh water at a temperature of about 73°. The stale water had, however, apparently been too injurious to them and they all finally died. It appeared to be pretty evident from this trial that while artificial aëration would increase to a certain extent the time during which the water could sustain the eggs in good condition, yet four and a half or five days were about the utmost limit of time the same water could be used over and over again. When used for this length of time the entire vitality appeared to be taken from it. This was probably from the using up of the oxygen contained in it, although the decaying organic material, sloughs, and dead eggs, of which there are always more or less mixed with good eggs, may have played a very important part in rendering the water unfit for sustaining life.

The end of the season was now at hand and good spawn was very difficult to obtain. We were thus prevented from trying other methods of using the water. The next method would have been to take enough water on board at the beginning of the experiment, in addition to that in the reservoir and cone, to enable us to give the eggs a complete change of water, drawing off the old and putting the other in its place once every three days.

If unused water—water which contains its normal amount of oxygen and which has not passed over the eggs so as to become tainted with decaying organic material—is all that is required to replace the used or partially exhausted water of the cone, then there would be no difficulty in keeping the eggs in good condition for a voyage of twelve or fifteen days, for it would be an easy matter to carry sufficient water in extra casks to make complete changes every three days for this length of time, or even longer. But as a trip can be made in from eight to nine days, or as that would be the length of time which would elapse before fresh water could be obtained, it would hardly be required to make over two, or perhaps three, changes. From our experience this year it seems highly probable that such an attempt would be entirely successful, and that a good proportion of eggs thus treated could be hatched out and the young fish distributed wherever it was desired to take them. In such an experiment the larger the amount of water passing over the eggs the longer the time required to exhaust it or render it foul. If the experiment should be tried again and for the same purpose, that is, transportation across the ocean, the apparatus should be just such as would be employed on ship board, and with the supply-reservoir made as large as could be conveniently carried. Then, by changing the water, aëration, and the use of a filter for the used water before it re-entered the supply-tank, it would seem as if success could be assured. At least, if this method cannot be made to answer the purpose it is very questionable whether any can. Several cones instead of one could be used, if desired, by simply connecting one cone with the next, each cone taking the outflow from the one preceding. In this case it would be neces-

sary to have the cones arranged in a series, each one with its top or outlet considerably higher than the one into which it flowed, as in Fig. 3 with the two cones, so that there should be sufficient motion in the water to keep the eggs stirring.

It may not be out of place to notice the fact that the eggs kept in the stale water were almost entirely free from any fungoid growth. Why these eggs should be favored in this manner is hard to say, and may be a question worthy of farther research. As regards the influence upon the development of the germ, there was a very marked difference in the two methods employed. In the ice-chest, in the case of freshly impregnated ova, segmentation would go on until the "mulberry" stage had been reached, or until a small limb or protuberance of small cells had been formed upon one side of the vitellus. After this there appeared to be an entire cessation of all development as long as the egg remained in the chest or until the vitellus disintegrated.

In most cases disintegration or death did not take place for two or three days, and up to this time the eggs had every appearance (otherwise than that they did not develop) of being alive and in fair condition. In the cone, however, development went on regularly and slowly from the very first, and continued until the water became of such a nature as to fail to longer nourish the embryos.

This development was such that in about two hours the "mulberry" stage had been reached; in sixty hours the segmentation cap entirely surrounded the yelk, and the young fish formed a prominent welt along one side of the vitellus; in seventy-two hours the eyes commenced to show; and in one hundred and eight hours, or four and one-half days, the tail portion, or that part free from the yelk, was as long as the portion attached to the yelk, the eyes very prominent, with the crystalline lens formed, the ear-cavity forming a semi-circular depression upon the side of the body above the yelk, the protovertebræ numerous, and the heart a small, single-chambered body, situated just back of the head, between the yelk and anterior end of the central canal, and just beginning to exhibit regular although somewhat spasmodic beats. In an embryo developed in fresh running water, at a temperature of 68° to 74°, those stages would be passed through, respectively, in four, ten, twelve, twenty, to twenty-six hours, showing a retardation in the case of the embryo kept in water at 56° of from three to three and one-half days. At this rate the young fish in the colder water ought to hatch out in about eleven to twelve days, and would probably, from their slower growth, be more hardy than those hatched in three to three and one-half days. It is to be regretted that these experiments could not have been begun earlier in the season, thus giving plenty of time for thoroughly studying the questions and arriving at some definite results, for although it would appear as if the method last suggested might be successful, yet a trial seems to be absolutely necessary before undertaking an ocean voyage.

WASHINGTON, D. C., *July* 3, 1879.

XVI.—ON THE RETARDATION OF THE DEVELOPMENT OF THE OVA OF THE SHAD (ALOSA SAPIDISSIMA), WITH OBSERVATIONS ON THE EGG FUNGUS AND BACTERIA.*

By John A. Ryder.

Several series of experiments at different times were undertaken by persons connected with the United States Fish Commission having for their object the solution of the following problems: "Is it possible to lower the temperature of the water in which shad-eggs are incubated so as to greatly retard and prolong the process?" "Is it possible to prolong the period of incubation so that large quantities of embryonized ova may be carried for long distances by land or water, so as to effectively stock distant or foreign waters?" These two queries, I think, clearly state the objects of the experiments, and also tacitly indicate the important results which would follow in case practical results should be attained.

That a decrease in temperature would impede or retard the development of ova has been known for a long time, and, without encumbering this essay with references it may be asserted as a truth based on physical reasons and facts. Physiologists and biological philosophers, such as H. Milne-Edwards and Herbert Spencer, have recognized and discussed the influence of fluctuations of temperature on physiological processes. Every genus and perhaps even every species of fishes, in the course of the early development of its ova, appears to present some idiosyncrasy of behavior which demands that its characteristics shall be studied before it is ventured to proceed with experiments of this character. Practically the peculiarities of the ovum of the shad are perhaps as well known as those of any species we are called upon to deal with.

Shad-eggs after impregnation are relatively large, measuring from one-eighth to one-seventh of an inch in diameter. When first extruded from the parent fish they measure about one-fourteenth of an inch in diameter, are somewhat flattened and irregularly rounded in form; the egg-membrane, a true *zona radiata*, is much wrinkled and lies in close contact with the contained vitellus. Immediately after impregnation this membrane becomes tense, is filled with water which has found its way through the membrane from the outside, and is now per-

* Second edition, revised.

fectly spherical, having apparently gained very much in bulk. This gain in size is, however, delusive: it is only the wrinkled egg-membrane which has been distended with water; the vitellus or true germinal and nutritive portion has gained nothing in size. The latter now lies in contact with the lowermost part of the egg-membrane when the whole ovum is at rest, and is always more or less depressed from above in the form of an oblate spheroid. After the germ has been developed, which is discoidal in form and placed on the surface of the vitelline sphere, it usually also occupies a lateral position on the vitellus when the ovum is at rest.

The vitellus rolls about and changes its position inside the egg membrane as the latter's position is altered. The vitellus is heavier than water. A large space filled with fluid now exists between the vitellus and membrane. No adhesive material is found on the outside of the membrane, as in the eggs of the white perch and herring, as may be readily demonstrated with the microscope, although when first extruded they are covered with a somewhat sticky ovarian mucus. The ova are heavier than water and rapidly sink to the bottom of the vessels in which they are undergoing development. All of the hatching apparatus now used for their incubation in water is operated on the principle of a continuous flow, which keeps the ova constantly in motion. So much for the physical behavior and constitution of the shad-egg, which is necessary for the comprehension of what will be said subsequently.

It has been the experience of those intrusted with the work of looking after the artificial incubation of the eggs of the shad that when the temperature of the water was highest the process was completed soonest, and when lowest it took a disproportionately longer time. In illustration of this fact the subjoined data, supplied by Mr. W. F. Page, are of interest, from the records which were kept at the station on the Potomac during the present spring (1881):

	Lot No. 1.	Lot No. 2.	Lot No. 3.
Time in hatching	148 hours.	109 hours.	70 hours.
Average temperature of water	57.2° F.	64.5° F.	74° F.
Average temperature of air	61° F.	66.1° F.	76.25° F.

This series of data shows that with a fall in the temperature of the water down to 57.2° F. it took six days and four hours to complete the development in the egg; with a rise in the temperature of the water to 74° F. the process was complete in a little less than three days. The difference in the times of hatching between lots No. 1 and 3 is 78 hours; the difference in the temperature of the water used is only 16.8° F. Is there a limit to the possibilities of retardation? Experiment has shown that there is. The temperature of ice-water, 38° F., was found to be fatal at the morula or germinal disk stage of development of the shad egg, in the course of experiments made at Havre de

Grace, Md., in 1880. The cells of the germinal disk became brownish, the cleavage furrows obliterated, the disk tended to spread out and become larger across. These phenomena indicated stagnation of development and death. The second series of experiments, conducted by what is known as the "dry method," in a refrigerator box provided with canton flannel trays, devised by Mr. F. N. Clark especially for these experiments, gave better results. We found that the ova merely kept damp on the trays in an air temperature of 52° appeared to develop quite normally, the only serious drawback being the rapid and more or less fatal development of fungus, the mycelium of which would soon grow over the eggs, penetrate the membranes, cause them to collapse, transform the protoplasm of the vitellus into fungus protoplasm, and kill the ova.

The following abstract from my note-book, recording what was observed in watching the results obtained from a trial of Mr. Clark's apparatus, speaks for itself, though it would facilitate the comprehension of the matter if a series of explanatory figures could be introduced:

"Eggs taken June 8 and put into refrigerator at 9 o'clock p. m.; examined June 9 at 9 o'clock a. m.; exposed for 12 hours to a temperature ranging from 54° to 60° F. Cleavage has advanced to the morula stage; *i. e.*, the germinal portion of the egg is still discoidal, lies on one side of the vitellus or yelk, and has not advanced beyond the condition ordinarily reached in three hours with the temperature 72° F.

"Same lot, June 9, 2.30 p. m., advanced but a little beyond the stage just described above; the germinal disk still maintains its characteristics; development normal; temperature 54° F.

"Same lot, June 10, examined at 9.30 a. m.; segmentation cavity developed and blastoderm forming; incipient embryo making its appearance at one side. The blastoderm, however, does not yet cover more than half of the upper hemisphere of the vitellus, a condition ordinarily attained in six hours with the temperature of the water at 72° F. Temperature in refrigerator box now ranging from 52° to 54° F. Eggs of the same age, 36½ hours, in a hatching-jar, have the vitellus completely inclosed by the blastoderm, the embryo formed, with eyes, ears, and brain distinguishable, and the tail is budding out as a small, rounded knob at the posterior end of the embryonic axis, which curves around one side and now extends from one pole of the egg to the other, embracing an arc of 180°.

"Same lot, in refrigerator, examined June 10, at 8.30 p. m., or nearly forty-eight hours after impregnation, shows that the blastoderm has grown down half way over the vitellus, like a hemispherical cap; the keel or carina has been developed. Temperature 53° F. in refrigerator all day. Eggs in a cone of the same age, temperature of the water 65° F., have the embryos well advanced, with the tail free and as long as the portion of the body still in contact with the yelk, but the natatory fold is not developed.

"Eggs which had progressed a considerable way in development, so that the tail was somewhat more advanced than the stage last described, and which did not yet have the eyes pigmented, were also experimented upon at this time. In consequence it was learned that such might be suddenly transferred from the water in which they had previously been undergoing development to the damp cotton-cloth trays without injury from such sudden and continued exposure to an air temperature of 53° F. A most striking fact was that in such as had the choroid or pigmented coat of the eyes in process of development had the formation of the pigment arrested in correspondence with the general arrest of development observed.

"Returning to the eggs of the 8th June, these were examined June 11, 9 a. m. Development is still normal; the eyes are perfecting, but the perfectly normal blastoderm does not yet quite cover the vitellus, the diameter of the opening at the caudal pole, where the vitellus or yelk is still exposed, being equal to about one-seventh of the circumference of the egg. Temperature during the night 49.5° F.

"Other lots of ova, taken on the 6th and 7th of June, and removed from the hatching-cones and put on the cloth trays in the refrigerator box, have been greatly retarded, but the development is normal, no abnormalities whatever having been observed. The lot taken on the 8th and put into the refrigerator on the 9th, after having been in the water for twenty-four hours, are well advanced, the tail being twice as long as the portion of the embryo's body attached to the yelk, and the fin-folds being nearly fully developed dorsally and ventrally.

"The eggs first put into the refrigerator on the evening of the 8th June now show a disposition to wrinkle, *i. e.*, part with the water inclosed between the egg-membrane and the vitellus, and are collapsing. Perhaps this is due to evaporation."

Afterwards I abandoned the view that evaporation was the cause of the collapse and wrinkling of the egg-membranes. I am now fully convinced that it was due to the invasions of a fungus.

"Same lot of eggs of June 8 examined June 11, at 7 p. m. Blastoderm not yet quite but very nearly closed over the vitellus. Only a very small round opening at the tail of the embryo marks the point where its closure is about to take place. Temperature 53° F. in refrigerator. Development normal in those which are not collapsing, after remaining seventy hours on the trays.

"June 12, 11 a. m., eggs of June 8 in refrigerator for the most part still alive. Temperature 52° F. Development has been normal up to this point; the blastoderm has closed over the vitellus, and the tail is just beginning to bud out as a rounded knob, as in twenty four to thirty-six hour embryos hatched in water ranging from 80° to 72° F.

"Eggs of June 7, partially developed, have commenced to collapse in the refrigerator box. This appears to be due to the growth of the fungus on the ova.

"June 13, 10 a. m., examined the eggs put into the refrigerator on the night of the 8th. They are now nearly all dead. Those not affected with fungus mycelium still plump and normal in development; caudal knob but a little more prominent than when examined on the 12th, at 11 a. m. Temperature in box 53° F."

We may sum up the result of these experiments as follows:

After a little more than four and a half days the ova of the shad exposed on cloth trays to a temperature of about 52° F. have not advanced further than they would have done in water at a temperature of 80° F. in 24 hours, or in 30 to 36 hours in water at a temperature of 74° to 68° F.

But after four and a half days our embryos have not yet passed through half of their development, so that it would be safe to say that the period of incubation at this rate could be prolonged for nine days, or a period long enough to readily admit of the transportation of ova so retarded across the Atlantic to England, France, or Germany. The bar to our complete success, however, was the rapid and fatal development of the fungus, which is probably a saprolegnious form identical with the one commonly productive of more or less loss in hatching out ova in water in all the forms of apparatus which I have seen used. If attention were directed to a means of destroying the germs of these organisms I think success might be very confidently anticipated. To effect the complete destruction of the spores in the water used, and to prevent their ever coming into contact with the eggs, upon which they lodge, germinate, and grow, are the preventive measures to be adopted. These measures are, I believe, feasible, but may involve some trouble in their execution. The experiments of Tyndall and Pasteur have taught us that it is possible to sterilize any fluid and render it absolutely free from all forms of organic germs by energetic boiling, taking care afterwards to exclude the germ-laden air by means of stoppers of cotton wool, or by hermetically sealing the vessel. Such a method would, of course, not answer in this case, as in sealing up a vessel containing the eggs in sterilized water they would be smothered. The precautions which are practicable, however, are these: (1) Take care to scald and thoroughly sterilize the pans into which the fish are spawned; (2) take care to wipe the spawning fish clean, and, above all, avoid rubbing off the scales or to allow these to drop into the spawn or milt; (3) use only sterilized water to "bring up" or water-swell the eggs; (4) take care to scald out the refrigerator and cloth trays, so as to sterilize these of any germs; (5) it would also be necessary to boil and sterilize enough water to keep the eggs and cloth trays moist during the process of retardation; (6) the sterilized water should be kept tightly covered in a clean vessel; (7) in managing the refrigerator care should be taken in opening and closing it, and in order to ventilate it the opening in the upper part of the chamber for the admission of air should be provided with a filter of cotton-wool; (8) it would be necessary to scald and sterilize new cotton cloths, since these are almost always laden with germs. These precautions observed

with scrupulous care would insure success, as far as the danger from fungus is concerned, in conducting this mode of retarding development.

The second series of experiments were conducted at Washington, in association with Col. M. McDonald, this gentleman having kindly undertaken to aid in the work of experimentation, by means of various ingenious forms of small and convenient hatching apparatus of his own devising, mostly made of glass. The method pursued consisted partly in treating the eggs for some time on the dry principle on trays, completing the incubation afterwards in the glass apparatus fed with water from a coil of tin pipe kept under ice in a refrigerator. This enabled us to maintain the temperature of the water supply at a pretty constant point, ranging from 60° to 63° F. It was necessary, on account of the distance which the eggs had to be transported, to use trays covered with damp cloths, on which the impregnated, water-swollen ova were carried in transit from the spawning grounds. The experiments were conducted in the basement of the Smithsonian Institution, where some of the trays of eggs were placed in a refrigerator and others put directly into the water at the temperature stated above, using the McDonald apparatus. The results of these experiments were of great interest and of considerable value, as giving us data for certain precautions to be observed in the conduct of future work and experimentation, as may be learned from the account of them which follows.

Colonel McDonald found it necessary to devise some ready means of transporting the ova from the spawning grounds over a score of miles down the Potomac. This necessity for an expedient proved that the transportation of ova by the dry method immediately after they had been water-swollen was possible, and that it would answer for long distances. To illustrate: some were kept on the trays in good condition for seventeen hours, in the ordinary temperature of the air, 70° to 80° F., prevailing at that season of the year (July). When the temperature of the air was up to 90° F. it was found that the ova carried on trays and allowed to remain on them would tend to spoil quickly, as *Bacteria* and *Vibriones* were distinguishable on all the spoiled putrescent ova carefully examined under the microscope. It is therefore evident that in warm weather, in transporting ova by the dry method for long distances, it would be necessary to take certain precautions to prevent the access of the germs of such putrefactive organisms to the eggs. Essentially the same method of procedure recommended to guard against the introduction of the spores of the saprolegnious fungus to the eggs would apply here. Such precautions, however, would only be necessary where it was desired to retard the development for a long time, in case it was desired to transport the ova long distances. I think it would be found practicable to carry eggs on trays on damp cloths for a period of twenty-four to forty-eight hours without the least difficulty, provided a refrigerating apparatus was constructed in which the temperature could be kept at 60° to 65° F.; below this temperature it would not be safe to go

for the ordinary purposes of transportation from the spawning grounds remote from the hatching stations. An important matter to attend to in the application of the above plan will be to effectively scald the cloths which are laid in the trays each time before they are again used, or else they will become the nidus of untold myriads of putrefactive germs which will lodge from the air in dust, and the retention and development of which would be favored by whatever of mucus, dead eggs, egg-membranes, and blood might adhere to the cloths from one time to another.

The putrefactive germs always liable to be conveyed in the impalpable dust constantly suspended in the air of houses in this latitude are consequently much more insidious in their approaches than the germs or spores of the saprolegnious fungus, which ordinarily causes a considerable loss of eggs in the hatching-cones. The eggs attacked by the fungus in the water first turn white; the egg-membrane then shows a disposition to wrinkle or become flaccid; the mycelium or growing stage of the fungus is now in active progress. The mycelium is simply a felted meshwork of branching fungus cells, which appropriates the substance of the egg and completely envelops its membrane. In this stage it is comparatively harmless. Afterwards from the felted mycelium threads club-shaped cellular prolongations grow out, which radiate in all directions like the seeds on a dandelion seed-head. In time each one of these club-shaped heads of the fungus, to the number of hundreds on every affected egg, develop a large number of spores or germs on the inside; directly the end bursts open and the minute spores swarm out of the club-shaped spore-case in great numbers. Each of the spores is capable of independent movement by means of long vibrating filaments attached to it at one end. These wander about in the water, lodge on healthy eggs, and grow on and destroy them, so it is important that infested eggs should be removed as soon as they make their appearance in the hatching apparatus. Kühne and Cohn have shown, however, that a temperature of 140° F. is sufficient to kill the germs of *Bacteria* and other putrefactive organisms, and it is very likely that such a temperature or less than the boiling point of water, 212° F., would be quite sufficient to clear off and kill any fungus germs which might adhere to the pans, trays, and cloths used in the transportation of ova.

The preceding account of the development, destructive growth, and maturation of the spores is from personal observations made on eggs infested with fungus in the hatching-cones on the barges at Havre de Grace in 1880, and it is only introduced here to direct attention to some possible means of staying or mitigating its ravages. I do not pretend to know the species by its botanical name. I leave its identification for the cryptogamic botanists; practically a knowledge of its life-history suffices for our purposes.

The following record of the most salient features of my observations, made in association with Colonel McDonald, is on the whole not as encouraging as the experiment made at Havre de Grace, Md., but it is of

value on account of the pathological changes or deformities which it was found were induced in embryos when they were subjected to too low a temperature. Only in the very late stages did they appear to be comparatively free from this influence tending to the production of deformities.

A lot of eggs which had the germinal disk biscuit-shaped and normally developed were placed on trays in the refrigerator in the evening, in an air temperature of 45° F. They were found in apparently normal condition after twenty-four hours had elapsed, but had made little or no progress in development. After twenty-four hours more, or after exposure for forty-eight hours to an air temperature of 45° F. on damp cloth trays, the germinal disk was found to be deformed and dead, being helmet-shaped, with one or two constrictions or furrows running round it. The vitellus or yelk still retained its normal appearance, however, the vitelline spheres being clear, with the protoplasmic mesh-work enveloping them in a normal way. Of the same lot, those which were taken out of the air temperature of 45° F. and put into water at 74° F. hatched out normally in a good percentage, without deformities, showing that a sudden transfer to water at a much higher temperature was not attended with difficulties. The prolonged stay of forty-eight hours of the the same lot in the refrigerator at 45° F. showed that complete arrest of development and death would supervene, and that a profound abnormal change in the form of the germinal disk would result.

Another series of experiments with eggs kept in a temperature of 64° F. showed the same tendency to retard development as was shown by the Havre de Grace experiments. Embryos of the same age in water at 74° F. developed nearly twice as rapidly.

Other experiments showed that eggs which had been retarded in development at a temperature a little below 52° F. for two days exhibited a tendency to develop abnormally. The abnormal phenomena which were noticed principally affected the notochord or embryonic axial cartilaginous rod, which had a tendency to become bent and twisted, while constrictions were also apt to appear, giving it an irregular, beaded, and generally misshapen appearance. Such deformities seemed to affect only the caudal portion of the notochord, the portion toward the head end of the embryo being normal in its appearance. In this way great deformities of the tail arose, so that in a microphotograph of an embryo two-thirds developed the tail, instead of being gracefully bent flatwise to one side, is abruptly bent downwards and then upwards, so as to be approximately V-shaped as seen from the side.

Sometimes the deformation of the tail would only be noticeable at its extremity; at others the deformed portion of the notochord would extend some way forward over the yelk beyond the point where the tail originated, as it budded out from above the point where the blastoderm closed. In no instance was it observed that any deformity or disturb-

ance of the structure of the yelk took place, or that the epiblastic or hypoblastic coverings of the latter were distorted.

The epiblastic coverings of the tail, however, showed a tendency to crumple and become distorted. It was also commonly noticed that the epiblast showed a tendency to proliferate or throw out masses of cells in the form of irregular knob-like clusters. These increased rather than diminished in size as development progressed. No other structure of epiblastic origin took part in the tendency to become misshapen. The eyes, nasal pits, and ear capsules were normal in every respect. The heart pulsated more slowly than in embryos hatched in water of the usual temperature. This was probably due to the benumbing effects of the low temperature.

When deformed embryos were transferred to water of 74° F. they showed no signs of regaining their normal shape, but, on the contrary, the deformity seemed rather to be aggravated as development proceeded. This was the case also when transferred to water ranging from a temperature of 60° to 64° F. Once established, any deformity in development seemed irremediable by any further stages which might be necessary to complete the developmental processes undergone in the egg.

In the light of these researches, taken in their entirety, it would therefore appear that 55° to 53° F. is about the limit to which we can with safety reduce the temperature in which the ova of the shad will undergo their normal development. This temperature would give us, approximately, nine days as the longest period of incubation attainable, time sufficient, added to the four days required for the young to absorb the yelk-sack, or thirteen days in all, to take embryos to be incubated on the route all the way across the Atlantic, or even as far as the Danube or Black Sea. Even this period may be somewhat extended, since it is possible to retard the absorption of the yelk-sack of the young fish by keeping them in water of 60° to 65° F. A temperature of 55° F. would probably not be injurious at this stage. I have kept the young in water at 38° F. for half an hour without apparent injury. They had been hatched only a short time before. The cold would benumb them, and they would lie quietly at the bottom of the vessel until restored to activity as they were warmed up in water of over 70° F., to which they were at once transferred without harm. The muscular masses at the sides of the body were benumbed, as indicated by the quiescent behavior of the embryos. Tissue metamorphosis would be hindered by such a fall in the temperature of the water. We saw that the cold caused the pulsations of the heart to diminish in rapidity. This abatement in the activity of the forces concerned in the transformation of the stored protoplasm of the yelk into the structures of the growing embryo would be very marked in consequence of subjecting young shad to a temperature of 55° F. By this means, reasoning from what we know of the other phases of development when exposed to like temperatures, the

absorption of the yelk might be retarded so as not to be completed for six or seven days. This would give us, added to the maximum period of incubation of nine days at 53° F., a total of fifteen days, a period certainly long enough for all practical purposes in the transportation of young fish for stocking purposes.

I would take this opportunity to remark that it must, however, be borne in mind that the growth of an embryo in the egg is different from the growth of the young animal after it has been hatched and begins to feed. The fish embryo has a store of food, which is inclosed in the yelk-sack, which can scarcely be said even to be transformed; it only suffers a change of place, as particle after particle of the yelk substance is removed and built up into the structures of the growing embryo. This transfer is effected through the blood, and also by apposition from below. The young growing animal in feeding must truly transform the protoplasm which it eats; it must digest it; it is carried into the blood as chyle, and so to all parts of the body to repair the waste incident to the exhibition of life. The two processes, upon careful comparison, are wholly unlike. A fall in the temperature diminishes the rate at which this transfer of the yelk substance to the structures of the growing embryo takes place. The frequency of the pulsations of the heart decreases; consequently the yelk substance which is in contact with vascular sinuses below the embryo is not taken into the blood as rapidly. The result of all this is that the absorption of the yelk is impeded and made to minister to the development and growth in size of the young fish for a longer period.

A few other points and I have done with this part of the subject for the present. Most steamships now use fresh water distilled by an apparatus specially constructed for the purpose. This water, provided the most ordinary care was exercised in the storage, would be well fitted to use in the process of retardation. The eggs carried on the trays ought to be occasionally sprinkled with pure sterilized water. The distilled water supplied aboard steamships answers this description fully, and almost everything is accordingly ready to our hands. To reduce the temperature of the water used in the latter stages of development, when it would be necessary to transfer the eggs to water, say on the eighth day, or after they had been for eight days on the damp trays, it would be desirable to avoid contamination of the water from the ice. To avoid this the water should pass through coils of block-tin pipe, placed in tubs, and kept filled with cracked ice; thus we could lower the temperature to at least 60° to 58° F. The same water might be used several times over, because with care it would be so slightly contaminated with organic matter that putrefactive processes could not go on to any hurtful extent. The low temperature would also tend to arrest any tendency to putrescence. How to maintain a uniform temperature in the refrigerators, so as to guard against dangerous fluctuations of temperature, appears to me to be a matter of some difficulty,

because sudden meteorological changes, such as we sometimes experience in this latitude, would influence the working of the apparatus. The best regulator would probably be a faithful attendant. The control of the temperature of the water flowing through coils surrounded with ice is, in the light of experience, a comparatively easy matter, as it has been found that in a coil of a given length the fluctuation in the temperature will not vary more than three or four degrees, if a little attention is bestowed in regulating the flow and keeping a good supply of ice packed around the coils.

The prevention of leakage or loss of water from the apparatus would be entirely overcome, both on board cars and steamships, by the adoption of the closed glass hatching-jars, of various forms, devised by Colonel McDonald. They appear to be cheap, and are very economical of room. There can therefore be no objection to the introduction of the apparatus into vessels and railway express cars on the score that it makes objectionable slop and slush on the floors or decks.

The foregoing, it appears to me, is an approximate solution of the problems which we set out to answer. Whether we are right another season's work ought to enable us to decide practically and finally, as we can now take up the subject intelligently. The preliminary experimental work has been completed.

LATER OBSERVATIONS ON THE RETARDATION OF THE DEVELOPMENT OF THE OVA OF THE SHAD.

The following data supplement and confirm in a somewhat remarkable manner the arguments put forth above. The facts there recorded were the results of experiments carried out with the help of apparatus specially designed to artificially lower the temperature of either the air or water in which the eggs were hatched. The value of the present series of observations depends entirely upon the fact that no artificial means were resorted to for the purpose of lowering the temperature, but that the eggs experimented upon, obtained, as they were, as early as the 9th of April, were, in consequence of the then prevailing low temperature of the water, subjected to no extraordinary or artificial condition arising from the use of a complex water or air cooling apparatus. The temperature of the water of the Potomac during the progress of the incubation of the eggs in question was at times as low as 48° F., but as a rule the water then in use in the McDonald hatching-jars, the apparatus utilized in the experiment, fluctuated only between 50° and 56° F., and even then very gradually, as the variation during any one period of twelve hours was rarely more than 1° F. There was a gradual but very slight rise in the temperature of the water from the beginning to the end of the experiment, which covered seventeen days. This gradual rise was covered by 6° or 7° F., as already stated. The average temperature of the water for the whole period was $53\frac{3}{4}$° F., which,

as we see, was only a little above the "danger point," 52° F., if we may so call it, as indicated by my observations made in association with Messrs. McDonald and Clark last year. The results of this experiment have shown us that it is possible to retard the development of shad ova so as to prolong the period of incubation for a period five times that normally occupied in the process in the height of the spawning season, or for almost fifteen days. During my somewhat extended observations on the eggs of this species no such length of time of incubation has been recorded, nor has any one, to the best of my knowledge, recorded the fact that under such conditions of temperature the progress of the evolution of the embryo was perfectly normal, as was the case in the instance now to be described. Several persons have insisted that shad ova developing in too low a temperature would be found to be imperfect, especially the eyes, which, it was said, did not apparently develop at all. The lowest temperature in which I have seen shad-ova develop normally was 49.5° F., as recorded in my report of the experiments during the spring of 1881. Neither in those nor in the embryos which are the subject of this paper was any abnormality observed in the development of the eyes or optic vesicles.

Now for the history of the progress of the experiment and the ova. The latter were taken at one of the Potomac stations organized upon the plan proposed by Colonel McDonald. They were impregnated on the 9th of April at 7 p. m., and brought to the Armory on trays and spread out on damp cloths by Spawntaker Jones. They were placed in one of the McDonald jars on the morning of the 10th of April, but, unfortunately for the fullest fruition of our hopes, during the night, owing to an accidental occurrence or to the meddlesomeness of some irresponsible busy-body, too large a supply of water was turned on, causing the largest proportion of the eggs to be thrown out by way of the escape-pipe of the jar. What were then left, amounting to probably two or three thousand, had to suffice for the material for this account of their development.

On the 11th of April the temperature of the water was 57° F. It had been about the same or a little lower on the 9th and 10th; the water of the Potomac, from which they were obtained at Ferry Landing, was on those dates as low at 48° F. On the 12th the thermometer indicated a temperature in the hatching apparatus ranging from 50° to 51.5° F. On the 13th the temperature ranged from 51° to 52° F. This was the fourth day, and sketches taken from the eggs at this time showed that the blastoderm was just about to close, a condition ordinarily attained in a temperature of 74° F. in somewhat less than twenty-four hours. On the 14th of April the temperature was 52° to 54° F.; on the 15th, 53° Fahr.; on this, the sixth day, the tail began to bud out. On the 16th the temperature was the same as on the previous day, and the tail had by this time, the seventh day, grown to about one-third the length of that of the just-hatched embryo. On the 17th, the tem-

perature was 53.5° F.; on the 18th, 51.5° to 52° F.; on the 19th, 53° to 53.5° F.; development still normal. On the 20th the temperature ranged from 53° to 54°; on the 21st, 55° to 55.5° F., and about this time, or on the twelfth day, the eyes began to show the first signs of pigmentation, becoming a shade darker than hitherto, verging toward brown. On the 22d the temperature of the water was 56°, falling to 55.5° F. On this, the thirteenth day, a few began to hatch; the eyes were now fully pigmented and normal in their development. On the 23d the temperature of the water was 55.5° to 54° F. On the 24th the temperature was from 54° to 54.5° F. During the 23d and 24th days of April the hatching continued, most of the embryos having ruptured their inclosing membranes on the 24th of April, or the fifteenth day of incubation. On the 25th the temperature ranged between 54.5° to 55° F., and on this date, or the sixteenth day, a few of the ova still remained unhatched. On the 26th the temperature was 55° F.; all of the ova were now hatched, and no abnormalities of any sort were noticed. The embryos, however, were for the most part lost, owing, as I think, to the circumstance that the water was allowed to flow too rapidly and violently through the hatching-jar.

The behavior of the hatching-jar was most admirable, but would have been still better had there been a larger quantity of eggs put into the apparatus. The most meritorious feature of the apparatus is the almost entire non-development of the saprolegnious fungus, which causes so great a mortality in some other forms of hatching contrivances in which all of the ova are not in continual movement. The very gradual, gentle, and continual rolling movement of the ova upon each other in the jar apparently prevents the spores of the fungus from adhering. The cleanliness of the apparatus is also to be commended, whereby the use of skim-nets for cleaning is dispensed with, while the material of which it is made—glass—enables one to watch the progress of development very satisfactorily from the outside of the jar with a hand-glass or pocket lens of moderate power.

On the seventeenth day of the experiment the hatched embryos were in the condition of those normally developed at 70° to 75° F., the yelk being ovoidal, clear, and plump. At the rate at which the development progressed it would take five times as long to absorb the bulk of the yelk of an embryo in a temperature of 53.75° F. as at 75° F., or about twenty-five days. This period, added to the prolonged time of incubation at 53.75° F., would cover a space of forty days, or more than twice the time required to carry embryo shad to the farthest confines of Europe. The probability therefore, is that we have exceeded the lowest temperature practically required for this purpose, 55° F. being a much more favorable and less dangerous temperature than that prevailing during the successful experiment of which we have just given a detailed account.

ON THE RATIONALE OF RETARDATION.

Every developing ovum is made up of certain cellular elements, each one of which is provided with a central nuclear body, which appears in the light of recent researches to be the directive dynamic center of all further changes involved in the successive cleavages undergone by the cellular elements constituting that portion of the egg immediately concerned in the formation of the embryo. The assumed disappearance of the nucleus of the egg has been proved not to take place in the act of impregnation, in not only invertebrate ova but also in vertebrate ones as well.*

The hypothetical assumption of a *Cytode* or *Moneron* stage of development in the ova of all forms by Haeckel does not, therefore, appear to be sustained by facts. These and other known facts, such as the recent observation of the metamorphoses of the nuclei of Rhizopods in the act of division (multiplication) also throws doubt on the existence of the *Monera* themselves, as Hensen has suggested.† Nuclear networks inside of cells, as well as intranuclear networks, seem to be of almost universal occurrence, according to the researches of Flemming, Klein, the Hertwigs, Pfitzner, Fol, and others on animals and man, and by Strasburger on plants. Indeed, so strikingly is this true that Strasburger has been tempted to utter the dictum *omnis nucleus e nucleo*, which in English means that all nuclei originate from pre-existing nuclei, just as formerly Schwann expressed himself to the same effect in relation to the genesis of cells. Such intracellular granular networks extending outwards from the nucleus through the protoplasm enveloping it may be seen well developed in the coarse vesicular connective tissue cells of the American oyster, of which I have mounted preparations. Vastly more complex intranuclear reticuli are found in the nucleus of the unripe eggs of the common slipper-limpet, *Crepidula glauca*. I have seen the granular threads in these undergoing the most wonderful active changes of form. Spindle-shaped nuclei, the opposite poles of which were joined by granular threads, have been observed in the eggs of Elasmobranch fishes by Balfour. These were in the act of division, or in the diastole condition spoken of by Flemming. Œllacher has seen granular threads radiating from the nuclei embedded in the cells of th. germinal disk of the trout in its early stages of development. These

*This disappearance is more apparent than real, and while the nucleus may disappear temporarily it soon reappears, showing that nuclear matter still exists in the cell in a concealed or disguised form.

†A. Brass has recently demonstrated the presence of a denser central body in some of the so-called *Monera* by the use of reagents; this central body he regards as answering to the nucleus, while his studies also show these organisms to be far from homogeneous. Huxley, in 1877, had doubts as to the constancy of this distinctive character of the *Monera;* see p. 73 of his Anatomy of the Invertebrates. The Hertwigs have since shown the *Foraminifera* to be nucleated, and Leidy has shown that a nucleus is not always absent in some types, as in *Biomyxa,* for example.

nuclear transformations consequently occur in the cellular elements of fish embryos. These observations are further supported by the fact that both Brooks and myself have observed undoubted evidence of the rythmical nature of segmentation in fish-ova, which ought to be the fact, since it has been shown that the metamorphoses of the nuclei are likewise rythmical in character.

The metamorphoses or changes in the form and structure of the nucleus, are in large part connected with the genesis of new cells, in the successive acts of cleavage or segmentation; their metamorphoses doubtless also play an important part in the functions of rejuvenescence and depuration of cells, or in the general functions, repair and waste, as well as in the excretory and secretory functions of organs. But in retardation we have nothing to do with these latter kind of nuclear metamorphosis; we are only concerned with the alternate elongation and contraction of the nucleus attendant upon the process of segmentation or the fissiparous genesis of new cells, in which the pre-existing nucleus of a cell, about to divide, elongates, becomes severed into two parts, which become, respectively, the nuclei of two new cells. In the process of cleavage it has been shown that during the act of cleavage the nucleus of the cleaving cell elongates, becomes spindle-shaped; that the opposite poles of the spindle become, respectively, the nuclei of the two new cells resulting from the completed process of segmentation. During the active stage the two poles of the spindle are joined by a barrel or spindle-shaped series of granular threads. When the segmentation is about to be consummated these threads, half way between the poles, are found to have developed nodes or swellings; these mark the point through which the segmentation furrow will pass, so as to separate the old cell into two new ones. The segmentation furrow, accordingly, passes at right angles across the long axis of the spindle-shaped nucleus. As soon as the segmentation has been effected the granular threads are withdrawn from the nodal points at the place where the segmentation furrow severed them, and are finally retracted into what were formerly the two poles of the spindle. These poles are now the nuclei of the two new cells, and as soon as the granular threads are withdrawn towards these new polar nuclear centers the latter become globular and pass into the resting stage. Afterwards they both elongate and go through the same process as here described in the course of subsequent cleavage. This alternate elongation of nuclei into a spindle-form and contraction into a spherical form in the process of cleavage has been called by Flemming the *diastole* and *systole* of the nucleus. They accompany the rhythmical phenomena of segmentation and give us a rational and philosophical interpretation of the phenomena of segmentation. It must, I think, be plain to any one that this is essentially a dynamic process, in which the Artisan of organization almost makes His methods of work visible.

It also affords a scientific explanation of the phenomena of retarda-

tion. Inasmuch as we have lowered the temperature of the air and water, the media in which the ova of the shad underwent their development, and find that it is retarded in consequence, we must naturally conclude that the rate of segmentation, upon which the rate of development directly depends, has been in some way interfered with or impeded in its progress. Since we also saw that the rhythmical metamorphoses of the nuclei were directly concerned in the process of segmentation—that in them the *vis essentialis*, essential force of segmentation, really resides—it appears to me that we are also really bound to conclude that the fall in the temperature has affected the activity of this *vis essentialis* of the nuclei, which are retarded in their metamorphoses, in consequence of which the rate of segmentation and development is retarded. This fully and clearly accounts for the resulting prolongation of the normal period of development when the temperature of the media in which the ova undergo their evolution is lowered as much as is consistent with their regular, healthful incubation.

If retardation is possible it ought also to be possible to accelerate development. For centuries it has been the practice to accelerate and maintain the growth of plants in hot-houses and forcing-pits during inclement seasons of the year. This is proof enough, as far as the vegetable kingdom is concerned, that acceleration of the processes of growth, which simply means that the acceleration of fissiparous cellular proliferation or segmentation is here possible. Its philosophy is the same in principle as that of retardation; acceleration is the converse or reciprocal principle as opposed to the former. According to a table given by Mr. R. E. Earll, in his paper on the development of the cod, in the United States Fish Commissioner's report for 1878, page 724, we learn that the minimum time of incubation for the ova of this fish is thirteen days, temperature of sea-water 40° F.; the maximum time, according to the same authority, is fifty days, temperature of sea-water 31° F. Our own experience at Wood's Holl last winter taught us that the development of the ova of the cod was capable of being accelerated, for those in a glass cone near a warm stove hatched out in a shorter space of time (sixteen days) than any others. Our power to accelerate the rate of development of the cod may be of use, as we may thereby be enabled to hatch out a large percentage of ova in a very few days. Whether the young would be as vigorous as those incubated in the natural way remains to be learned.

Acceleration, like retardation of development, is accomplished by influencing the rate of the rhythmical metamorphoses of the nuclei of the cells of the embryo. Accelerate the rate of these metamorphoses and segmentation is hastened so as to cause development to proceed more rapidly. The stimulus is heat, a mode of motion, and we are forced to believe from what has preceded that the nuclear metamorphoses are simply the specific modes of motion of the cellular life centers. The molecules of the nuclear spindles, reticuli, &c., are made to move more

or less actively in obedience to the fluctuations in the activity of this external stimulus. All this goes without saying, however, that the protoplasm, which in the case of every cell invests the nucleus, may not also share in the process; it is but natural that it should, because free nuclei, independent of any investment of protoplasm, are unknown to histologists.

Inasmuch as the granular particles of nuclear fibers and reticuli exhibit certain modes of motion which appear to be characteristic in the course of segmentation, and since we find that heat, admittedly a mode of motion, accelerates or retards the motion of living nuclear matter in its segmentational metamorphoses, are we not warranted in assuming both of these kinds of motion to be in a degree correlated and interdependent? The significance of the views here set forth in their bearings upon general physiology and pathology would appear to warrant the belief that we may yet be able to solve some of the knottiest problems in biology. Their practical significance in relation to the problems which have presented themselves for solution to the Fish Commission will also be apparent.

APPENDIX D.

PROPAGATION OF FOOD-FISHES.

XVII.—REPOPULATION OF THE WATER-COURSES IN BELGIUM.

By Baron De Selys Longchamps.*
[Member of the Royal Academy of Belgium and president of the Senate.]

Belgium has finally decided to attempt the repopulation of her water-courses. Our river fisheries, formerly so rich, especially in salmonoids and crawfish, are in greater danger than those of almost any other country. The causes of destruction are manifold, and they can be partially overcome only by great and persistent efforts.

Our two great rivers, the Meuse and the Scheldt [Escaut], differ in their character, and consequently produce different fish. From Antwerp downward the Scheldt becomes an arm of the salty sea, and the tide can even be noticed above that city. In this portion of the river the existence of fish does not seem to be endangered by the pollution of the waters. They catch there, at the proper seasons, the *Alosa finta*, the *Osmerus eperlanus*, and the *Coregonus oxyrhynchus;* but the last-mentioned fish cannot be very common, for in the Brussels market I have only found it in rare cases, and mixed with the *Osmerus eperlanus.*

The eel (*Anguilla vulgaris*) and the small plaice (*Pleuronectes flesus*) are very common there at all times. The sturgeon (*Acipenser sturio*) ascends as far up the river. In its upper parts and its tributaries towards Flanders, Hainault, and Brabant the Scheldt is fearfully polluted by the factories of Roubaix, Turcoing, Ghent, and Brussels. Formerly it was full of fish, although the fish suffered greatly from the pollution of the waters caused by the retting of flax in those parts of Flanders where this industry is carried on.[1]

The Meuse was celebrated for its salmon (*Salmo salar*), which ascended this river in order to spawn in its fresh-water tributaries which flow into it from the Ardennes and other mountainous regions on its right bank. The shad (*Alosa communis*) used to ascend the Meuse in spring

* "*Repeuplement des cours d'eau en Belgique,*" *par M. C. Baron de Selys Longchamps.* [From *Bulletin mensuel de la Société d' Acclimatation de France, 3d série, tome x, No.* 3, *Mars,* 1883, *Paris.*] Translated from the French by Herman Jacobson.

[1]Under the title "*Suppression totale du rouissage putride par l'application dex système de M. Lefèbre*" (Total suppression of putrid retting by the application of Mr. Lefèbre's system) an important pamphlet has appeared, which was read at the meeting of the Central Society of Agriculture of Belgium, June 13, 1881. (Brussels, E. Guyot, 1881.) The practical results of this method are given in detail.

in enormous numbers, but rarely higher than Huy. Most of the rivers which flow into the Meuse, the Vesdre, Ourthe, Hayoux, Bocq, Lesse, Semoi, and their tributaries, were full of trout (*Salmo fario*) and ombres (*Thymallus vexillifer*), not to mention other food-fish which are found throughout the whole middle portion of Western Europe.

This paradise of fishermen has well-nigh been destroyed. To meet the needs of boating and navigation towards France great river improvements have been made along the entire course of the Meuse. The dams in the river prevent the greater part of the salmon from ascending it. Those fish which succeed in clearing these obstacles are scarcely able to do it except by favor of high tides and occasional inundations.

As regards the shad, which not long ago gave rise to truly miraculous fisheries near the city of Liège,[2] it is stopped by the dams found farther down the river; and I do not think that it will be able to clear the salmon ladders which are going to be established, let us hope under better conditions than those which have hitherto been tried. We may not indulge in the flattering hope of seeing the waters of the Vesdre again rendered sufficiently pure to support fish. They have been too strongly poisoned by the washing of wool and the dyeing establishments and cloth manufactures of Verviers.

It might not be impossible, however, to arrive at a satisfactory solution of the question by leading the polluted waters of Verviers as far as the Meuse through channels running parallel with the Vesdre. Works of this kind are now constructed, at a moderate expense, for leading the juice of the beets from the places where they are grown and first ground to the sugar-refineries, a distance of several miles. As a work of this kind on a larger scale we may mention the collecting channel of the Senne, at Brussels, and also the works constructed in England to lead the refuse water of London into the sea. This last-mentioned work has been so successful that recently trout have been caught in the Thames, where they had long since disappeared. In the water-courses of the right bank of the Thames, where the water has remained pure, trout is found, but unlicensed fishing is there carried on on a large scale.

As regards the tributaries of the right bank of the Meuse, the industries which there kill the fish are manufactures of chemicals, sugar-refineries, and to a less degree distilleries.

Excellent laws have been made for regulating the fisheries and for suppressing the mischievous destruction of fish, but as it is out of the question for us to restore the salubrity of the waters by taking measures which would render industry impossible, we must appeal to science if we wish to obtain the means for rendering healthy the poisoned waters of our rivers.

When pisciculture came into vogue, almost forty years ago, it was

[2]At the end of April and in the beginning of May I remember to have seen taken near Liège, at one haul of the net, as many as two hundred and fifty and even three hundred large shad.

thought people had solved the problem of the repopulation of our rivers. The founding of the Society of Acclimatization in France, and the establishment of the piscicultural station at Hüningen gave the first impetus. Prior to this the King of the Belgians, Leopold I, had successfully engaged in fish culture on his estates in the Ardennes, following the old methods of the German foresters.

In 1853 M. Ernest von den Peereboom had spoken in favor of fish-culture in the Chamber of Representatives. Experiments which were made at the time, but in waters very little suited to the purpose and with defective apparatus, did not prove successful.

Some time afterward a more important society of fish-culture was formed, and serious efforts were made. This society, however, only existed a short time. The mistake had been made to embrace in its work too many branches of this new science, and to attempt, moreover, the culture of oysters and salt-water fish at Nieuport, which place did not possess all the conditions necessary for such culture. People finally entertained the idea, which was widely spread at the time, that trout and even salmon could live in all the pure waters of the country and prosper, even when shut up and in a state of confinement. Hence the mistakes and finally the dissolution of the society, which was composed in great part of persons whose property was not in the region where salmonoids can live.

Although for twenty years the question may be said to have slept, from a practical point of view it has at least not been buried, for several times during this period it has given rise to public discussions and various publications. It is necessary to give a brief historical sketch of the phases through which this question has passed before its active awakening.

In 1865 and 1866 the provincial council of Brabant appointed a commission whose duties were to study the best means for purifying the water-courses, and to find means for repopulating our brooks. The late M. de Gronckel prepared the report of this commission, and stated in it that in this matter the most powerful interests centered, which it has became the duty of the authorities to protect, to harmonize, and conciliate as much as possible, above everything the interests of health and security from inundations. To this must be added, he says, a question of alimentation and national wealth, viz, that of preserving and multiplying the fresh-water fish.

The "Free Society of Emulation" of Liège, at the instance of my regretted friend, Theodore Lacordaire, professor of zoology at the University of Liège, set a prize for the best answer to the following question: "*To determine the causes which for the last twenty years have brought about a degeneration of fish in the rivers of the province of Liège, and to indicate the means for remedying this state of affairs.*"

The prize essay, which was printed, came from the pen of the late Charles Lehardy de Beaulieu, a well-known and highly esteemed en-

gineer and economist. He attributes the decrease of fish to the excess of consumption over production. He strongly recommends pisciculture and a proper regulation of the ownership of water-courses, the use of which he would like to see placed in the hands of associations whose interest and perseverance would finally succeed in discovering the various causes by which the water becomes impure. He thinks that, forced by sheer necessity, people would endeavor to utilize as manure, or in some other way, the hurtful substances, which at present they find convenient to throw into the river. He cites the example of the city of Reims, where the soap water which has served for cleaning wool is used in the manufacture of gas[3].

In the same year (1866) I was a member of a commission appointed by the Government for studying on our coasts various questions relating to the sea-fisheries. This commission expressed the wish that a similar inquiry might be made relative to the fresh-water fisheries. In December, 1866, I read, at the meeting of the division of science of the Royal Academy of Belgium, an essay *On the River Fisheries in Belgium*, which was published, accompanied by notes and documents.[4] It would be useless to give an analysis of it in this place, for it would only be a repetition of a statement of facts, which are but too well known to the public, relative to the causes of the depopulation of our rivers and the means to lessen their evil effect. The portion of the evil which must be attributed to the pollution of the water has grown considerably since that time.

The draft of a fishery law which, as I announced in a postscript, had been prepared by the Government, had to wait for fourteen long years before it was discussed and voted on by the Chamber of Representatives.

In 1879 M. Emile Gens, doctor of natural sciences and professor at the College of Verviers, published a very interesting little brochure on the protection of fresh-water fish in Belgium (*De la protection du poisson d'eau douce en Belgique*). The author, after having sketched in brief outline the deplorable condition of our river-fisheries, proposes the following measures for remedying the evil: (1) Prohibition of fishing in all rivers and canals during the months of April and May; (2) prohibition of fishing from September 15 to January 1 in all water-courses on the right bank of the Meuse (it is here that the salmonoids live), permitting, however, the fishing of salmon after November 15, the spawning having then taken place; (3) severe fines for employing dynamite and *Cocculus indicus;* a systematized supervision of the rivers. (4) prohibition of the sale of *Cocculus indicus* in drug-stores; (5) prohibition of all night fishing; (6) prohibition of fishing in streams by means of

[3]The memoir of M. Lehardy de Beaulieu, preceded by the report of M. Lacordaire, was published in 1866, in vol. iii (new series) of the *Mémoires de la Société libre d'Émulation de Liége.*

[4] *Bulletins de l'Académie royale de Belgique,* 2d series, vol. xxii, 1866.

weirs or dams which lay dry for a time a portion of the bed; (7) regulating the size of meshes so as to allow all fish measuring less than 15 centimeters to escape from the nets; (8) establishing salmon-ways wherever obstructions exist of such a nature as to prevent the migration of fish; (9) prohibition of fishing with the hand, &c.; (10) measures to prevent as much as possible the pollution of the waters by manufactures established on their banks; (11) serious efforts at organized fish-culture; (12) committees of surveillance, furnished with the necessary authority to prohibit fishing locally and temporarily, in the interest of the repopulating of the rivers.

In the following year (1880) M. Gens was commissioned by the Government to visit the Berlin Fishery Exposition, and attend the Piscicultural Congress which opened its sessions in that city in April. His report was published in the *Moniteur belge* for September 19, 1880.

Our honored colleague M. Raveret-Wattel has in the *Bulletin Mensuel de la Société d'Acclimatation de France* produced such an excellent and complete work that I deem it unnecessary to give an epitome of M. Gens's work on the same subject. I will confine myself to pointing out some of its details. The author mentions the fact that several essays had been written on the problem of rendering the water from manufactures harmless to the fish in those parts of the river where such waters are emptied. It is well known that the King of Saxony had set a prize for the answer to this question, which is of great interest to us in Belgium. M. Gens also mentions a simple means, which had been spoken of at the congress, of rendering small water-courses, such as those which drive mills, pure. If the dam is constructed on an inclined plane, it is sufficient to place a beam obliquely across this place, which is certainly inexpensive, and should be done in all cases. In chapter 4 he takes up the principles laid down in his pamphlet of 1879, mentioned above, and supplements his former statement by giving a list of nearly all fresh-water fish found in Belgium, which he, according to their nature, classes in three groups: those which are common to our two regions, those which are found in the mountainous region, and those which are found in the plains.

In a special chapter M. Gens treats of piscicultural establishments.

Belgium did not possess a large sheet of water combining purity, coldness, and depth, where it might be hoped that the salmonoids of the Swiss lakes could be acclimatized. To-day this is different. In order to check the temporary inundations of the Vesdre, and at the same time to supply water to the city of Verviers, which at certain seasons suffered from the want of it, there has been constructed from one mountain to the other, near the mouth of the Gileppe, at the height of 241 meters above the level of the sea, a gigantic dam, 47 meters in height, which when filled holds 12,000,000 cubic meters of the waters of that sub-Alpine river, which receives all which flows into this dam from a forest of about 4,000 hectares called the "Hertogenwald," and from the marshy

regions called the "Hautes-Fagnes," which at their highest point rise to a height of 700 meters. The Lake of Gileppe, which has thus been formed, has an area of 800,000 square meters, and the water in the dam has a depth, varying from 25 to 45 meters.

Here I would advise the introduction of the great lake trout (*Salmo lacustris*) and the trout of the Alps (*Salmo salvelinus*), of the *Coregona fera*, and of certain American salmonoids which do not go into the sea, and which would find all possible levels for spawning from the dam to the river flowing in its pebbly bed and feeding the lake.

Our minister of public works commissioned M. de Clercq, chief engineer of bridges and roads, to prepare some propositions as to the best mode of repopulating the navigable rivers. The remarkable work of this skilled engineer was published in 1881.

The propositions which he makes for remedying the depopulation of our waters are classed in the following order:

(1.) To prevent the pollution of the waters.

(2.) To prohibit the destruction of sedentary fish during the spawning season, and to regulate the catching of migratory fish.

(3.) To construct fishways at all dams in the Meuse and its tributaries which are too high for the salmon to leap over.

(4.) To arrange spawning-places where the fish find all the conditions favorable to reproduction.

(5.) To engage in practical fish-culture as far as the salmonoids are concerned.

These various points are carefully treated by a man fully competent to do justice to the subject. I will quote what he says relative to the pollution of the waters, because this is, in my opinion, the principal obstacle in the way of repopulation:

"There can be no question of prohibiting industries which are closely interwoven with the general welfare of our country, but it is important to prohibit the throwing of substances into the water without having been treated in the most efficient manner for freeing it from those substances which are hurtful to fish, and at least as much so to other animals which drink this polluted water. The pollution cannot be considered as sufficiently weakened unless the waters are rendered fit for fish to live in."

There is another chapter in this work which will repay careful perusal, the one in which M. de Clercq describes in detail the construction of good salmon-ways, and indicates the defects which make some salmon-ways worthless. We must here point out, in a humbler sphere than the management of great rivers and the interests of the salmon fisheries, the obstacle which many water-mills present to the repopulating the small streams. I refer to those mills which are placed near small water-courses in plains which have but a slight grade. When the mill is not placed on a channel branching off from the river, but blocks the river entirely, it interrupts the circulation of the fish. The level of the water will under these circumstances vary constantly: sometimes, when the

mill is at rest, it will be very high; at other times, when all the water is utilized by the mill, it will be so low as almost to lay the river dry. Under these conditions the reproduction and the very existence of fish becomes impossible. If one takes account from another point of view, of the enormous harm which is done to rivers by the fact that the water in these water-courses is nearly always kept at too high a level, thus making the rivers marshy; if furthermore it is remembered that mills render temporary inundations more dangerous, that great damage is done to agriculture, and finally that public health is endangered, it is to be desired that the water-mills of which I have spoken should as soon as possible, be replaced by wind-mills, or, still better, that they should obtain their motive power from a small steam-engine.[5]

By the provisions of the "Law of the river fisheries," passed by our Chambers towards the end of the year 1881, the supervision and preservation of these fisheries is placed in the hands of the administration of forests. The right of fishing in navigable rivers and canals belongs to the Government, which farms out the fisheries, thus deriving a profit therefrom. Fishing with a line held in the hand, however, is free to all citizens. In other water-courses than those mentioned above the people living on the banks possess the right of fishing. The season when fishing is allowed and the implements to be used are determined by the Government, which also regulates the sale of fish. Fishing is allowed at all times to proprietors of ponds and reservoirs whose waters have no natural communication with the rivers. Boatmen are prohibited from having on board any fishing apparatus but lines. As regards the throwing into the water of hurtful substances, when not done with the object of destroying fish, it is regulated by the "Law on water-courses," previously passed by the Chambers. As, unfortunately, the carrying out of these regulations is in the hands of provincial and communal authorities, which are elective, much remains to be desired. In my opinion the central Government ought to have charge of this supervision.

After the law on river fisheries had been passed a member of the division of science of the Royal Academy of Belgium thought that a favorable time had come for encouraging scientific researches and practical experiments in repopulating the polluted water-courses. He placed at the disposal of the Academy the sum of 3,000 francs as a prize to be given, in 1884, to the author of an essay which would indicate a satisfactory solution of this problem.

At the end of this article I shall give the conditions of this competition as they are found in the transactions of the Academy, with the view of directing to it the attention of scientists and practical pisciculturists who might feel inclined to compete for the prize.

Although the conditions mention certain local questions which spe-

[5] This last-mentioned system has recently been recommended in a petition of the inhabitants of the banks of the Geer, a tributary of the Meuse on its left bank, in which petition they ask the Belgian Government to order the suppression of all water-mills, as a measure of public usefulness.

cially concern Belgium, it is my opinion that any one capable of answering the principal questions could easily put himself in possession of the necessary information. I am moreover convinced that many parts of France are situated like Belgium as regards rivers whose depopulation is caused by the pollution of the water.

It was on the 1st of April, 1882 (a very appropriate day for discussing the fish question), that the Academy, by a great majority, passed the resolution to invite competition for the prize referred to above. It was not a public session, but I believe that I shall not be guilty of an indiscretion if I state in a general manner the principal objections raised against this proposition by conscientious men of science. One of them thought that this would draw the Academy into an administrative sphere, which was not, properly speaking, its domain, and that it would look as if the Academy was under the impression that the laws of the land were not properly executed, especially that of May 7, 1877, "on water-courses not suitable for navigation and rafting," which imposes fines on persons who throw into the water substances liable to pollute or change it. The law also provides that owners of water-courses who have in this manner had their property injured may bring the matter into court.

Another member of the Academy remarked that he had made many researches with the view of finding a suitable and practical method for purifying the waters from manufactories, but that all these researches had failed to lead to a satisfactory end. He mentioned the evaporation of polluted water which certain manufactures are compelled to introduce, which process, however, produces a smoke having an odor which becomes almost unbearable for persons living in the neighborhood. He moreover thought that with our elective system few persons would dare to strictly carry out the necessary measures. He finally felt certain that the question was full of dangers on account of the exigencies which would arise if the present condition of the waters was made widely known, and it was stated at the same time that so far no remedy had been found for this deplorable condition.

A third member asked that statistics be prepared showing the amount of capital invested in the industries in question, and that this sum should then be compared with the value of the fish destroyed by waters polluted by manufactures. The author of the proposition has answered, in substance, that the scientific solution of this problem comes very properly within the province of the Academy; that there is no idea of finding fault with the administration, as, on the contrary, it was intended to call science to its aid to furnish it with the practical means of attaining the object for which the law was intended. He calls attention to the fact that the programme invites research for the purpose of finding means of purifying the water, which would make it possible for fish to live in it, with the express reservation that these remedies shall not endanger the existence of manufactures. In his opinion the value of the manufactures and that of the fish which they destroy by render-

ing the water impure are not, strictly speaking, comparable, because manufactures are private enterprises whilst water-courses and fish are of general use to all the inhabitants of the regions through which the rivers flow.

Soon after the Academy had passed the resolution referred to we received the programme of the Great International Exposition of the Products and Apparatus of Fisheries which was to open in London on the 1st May, 1883. It has given me great satisfaction to find in this programme two paragraphs which agree entirely with the demands of the Belgian Academy. Under Class IV (pisciculture) we read (division 39): "It is desired to show a system for destroying the hurtful effects to fish of rivers and streams impregnated with water from sewers, chemical and other products, a system illustrated by models and designs." In division 40 we read the request for the solution of a problem intimately connected with the one just mentioned, viz, "physico-chemical researches of the quality of fresh and sea water which is hurtful to aquatic aninals," &c.

The Belgian Government, recognizing the necessity that our country should not remain behindhand in this great movement which is going on everywhere, has appointed a commission of six members to study the questions relating to the repopulation of our water-courses.

This commission is composed of Lieutenant-General Baron Goethals, president; Baron de Selys-Longchamps, president of the Senate and member of the Academy; Willequet, member of the Chamber of Representatives from Ghent; Edouard von Beneden, professor of the University of Liège, member of the Academy; De Clercq, inspector-general of bridges and roads, Brussels; Emile Gens, doctor of natural sciences, professor at Verviers; Leyder, professor of the Agricultural School of Gembloux; Mousel, inspector of waters and forests, Arlon; Denis, merchant pisciculturist, Brussels; and Bernard, chief of division in the department of the interior, secretary. This commission, appointed October 27, 1882, has already held several meetings, at each of which different communications have been made, and have led to discussions having for their object the study of the proper measures which should be taken to satisfy the wishes of the Government. We have reason to believe that this activity will not relax, and that active work will soon be begun.

Here follows the programme for competing for the prize, adopted by the Academy:

ROYAL ACADEMY OF SCIENCES, LITERATURE, AND FINE ARTS OF BELGIUM.

Class of Sciences—Extraordinary competition for 1884.

The Government has proposed and the Chambers have passed a law which has for its object the preservation of fish and the repopulation of our rivers.

The principal obstacle in the way of attaining this end is the pollution of the water in the small streams which are not suitable for navigation or rafting, which are corrupted by solid or liquid substances thrown into the water by various manufactures, and which are hurtful to the reproduction and existence of fish.

The Academy appeals to science to aid in the accomplishment of the objects had in view by the authorities. Accepting the proposition of one of its members, who has generously placed at its disposal the sum of three thousand francs, it requests that a thorough study should be made of the following questions, both chemical and biological:

(1.) Which are the special substances in the principal industries which when mingling with the water of small streams render them incompatible with the existence of fish and unfit for the use of man and beast.

(2.) Prepare a list of the Belgian rivers which have become depopulated from this cause, indicating the industries peculiar to each of the rivers, and give a list of the food-fish which used to live in these rivers before the establishment of the manufactures.

(3.) Indicate practical means for purifying the water before it leaves the manufactories, so as to render it fit for fish to live in, without endangering the industries, by combining the aids afforded by the construction of clearing-basins, by filtering, and by the employment of chemical agents.

(4.) Make special experiments relative to the substances which in each industry cause the death of fish; and also relative to the degree of resistance which each kind of food-fish can offer to its destruction by the causes above mentioned.

The treatises must be written legibly, and should be addressed, prepaid, to M. Liagre, permanent secretary, at the Palace of the Academy, not later than October 1, 1884. The Academy requests that all quotations should be exact. Authors will, therefore, indicate the edition and the pages from the works quoted. Illustrations will only be admitted when drawn by hand. Authors will not sign their name to their treatise, but will simply sign by some mark, which they will reproduce in a note containing their name and address. Failure to comply with this formality will prevent a person from obtaining the prize. Treatises sent in after the above-mentioned date, or those whose authors make themselves known in any way whatever, will be excluded from the competition.

The Academy deems it proper to call the attention of authors sending in treatises to the circumstance that from the time when such treatises are submitted to the Academy they are and will remain deposited in its archives. Authors, however, can have copies of their treatises made, at their own expense, by addressing their request to the permanent secretary.

XVIII.—A STATISTICAL REVIEW OF THE PRODUCTION AND DISTRIBUTION TO PUBLIC WATERS OF YOUNG FISH, BY THE UNITED STATES FISH COMMISSION, FROM ITS ORGANIZATION IN 1871 TO THE CLOSE OF 1880.

By Chas. W. Smiley,
[Chief of the Division of Records, Statistics, and Publications.]

The following tables were prepared with a primary view to furnishing the Tenth Census with suitable summaries of the work done by the United States Fish Commission. The data have been obtained from the records of the United States and State Commissions and by official correspondence, in the name of Prof. Spencer F. Baird, with the persons to whom he ordered eggs or fish to be sent. The tables have been prepared with great care and labor. They are as full and accurate as possible under the circumstances, and may be considered as very exact. Much of the clerical work upon these tables, as well as upon the index thereto, which follows, has been performed, under my careful supervision, by Mr. Carl Brandes, Mr. S. S. Alden, and Mr. C. E. Latimer, each of whose honest and painstaking labor I desire to make public mention of.

These tables consist of four series, marked A, B, C, D.

PRODUCTION.

A. This table gives the stations operated for shad-hatching from 1872 to 1880, inclusive. It shows a total of 41 stations operated in the 9 years, with a total production of 102,388,350 shad, of which nearly 44,000,000 were released where hatched, and nearly 54,000,000 transported to other waters.

B. This series of three tables relates to the production of California salmon. The first table shows the disposition made of 50,761,000 salmon eggs, 4,000,000 of which were sent abroad, 15,000,000 hatched and returned to the McCloud River, and 31,000,000 sent overland to the Eastern States. The second table shows the success in hatching these 31,000,000 eggs, the data being arranged by years, while the third table shows the same data arranged by States. These show an average loss of 25 per cent.

DISTRIBUTION.

C. This series of six tables summarizes by States the distributions of (1) shad, (2) California salmon, (3) Schoodic salmon, (4) Penobscot salmon, (5) whitefish, and (6) California trout, during each year from its commencement to 1880, inclusive.

D. This series of six tables corresponds to the precedings series of six, and gives in detail the items which are summarized there.

A.—*Shad-hatching stations operated by the United States Fish Commission, or by some State commission, to furnish young shad for distribution by the United States Fish Commission, 1872 to 1880, inclusive.*

[NOTE.—At some of these stations much additional work has been done by State authority, and which is therefore not included herein.]

Dates.		Location of stations.		Person in charge.	Number of shad hatched by the United States Fish Commission and released where they were hatched.	Transported by the United States Fish Commission to other waters of the United States and there planted.	Number lost in attempting to transport in the United States.	Number hatched for miscellaneous purposes.	Total product of shad at each station.	Remarks.
Season began—	Season ended—	Water.	Place.							
1872.	1872.									
June 30	July 5	Hudson River	Coeymans, N. Y.	Seth Green		55,000			55,000	Station opposite Castleton, N. Y.
July 3	July 7	Connecticut River	South Hadley Falls, Mass.	Conn. and Mass. commissioners.		804,000	1,196,000		2,000,000	See trip of Rev. W. Clift with 2,000,000 fish.
						859,000	1,196,000		2,055,000	Rport of 1872.
1873.	1873.									
Apr. 20	Apr. 28	Savannah River	Augusta, Ga	Seth Green						Station failed for lack of ripe fish.
Apr. 29	May 13	Neuse River	New Berne, N. C	do	45,000				45,000	
May 15	May 30	Roanoke River	Weldon, N. C	do						100,000 rock fish were hatched at this station.
June 10	June 30	Delaware River	Point Pleasant, Pa	J. H. Slack, M. D	433,000	15,000			448,000	Station opposite Lambertsville, N. J.
May 17	June 10	Potomac River	Jackson City, Va	J. W. Milner	1,370,000	70,000	20,000		1,460,000	Station opposite Washington, D. C.
June 13	June 30	Hudson River	Coeymans, N. Y.	M. A. Green		270,000			270,000	Station opposite Castleton, N. Y.
July 2	July 22	Connecticut River	South Hadley Falls, Mass	Conn. and Mass. commissioners.		800,000			800,000	
					1,848,000	1,155,000	20,000		3,023,000	
1874.	1874.									
June 24	July 3	Hudson River	Coeymans, N. Y.	J. W. Milner		400,000	10,000	100,000	510,000	100,000 started for Germany; lost on the way.
July 13	Aug. 15	Connecticut River	South Hadley Falls, Mass.	do		2,631,000	5,000		2,636,000	
June 28	July 15	Delaware River	Point Pleasant, Pa	G. A. Anderson	530,000				530,000	
					530,000	3,031,000	15,000	100,000	3,676,000	
1875.	1875.									
Apr. 14	May 10	Neuse River	Kinston, N. C	J. W. Milner						No ripe fish obtainable.

May 12	May 20	Pamunkey River	Fish Haul, Va	F. Mather						Do.
June 11	June 25	Hudson River	Coeymans, N. Y	N. Y. commissioners		425,000			425,000	
July 2	July 30	Connecticut River	South Hadley Falls, Mass	C. C. Smith	4,500,000	2,045,000		400,000	6,945,000	400,000 started for Germany; lost on the way.
May 26	June 7	Potomac River	Moxley Point, Md	J. Mason	1,182,500				1,182,500	
July 8	July 16	Delaware River	Point Pleasant, Pa	N. J. commissioners		200,000			200,000	
May 15	May 25	Potomac River	Free Stone Point, Va	J. Mason	1,156,750				1,156,750	
May 18	June 5	do	Jackson City, Va	H. W. Welcher	1,072,800				1,072,800	
May 21	May 29	do	Ferry Landing, Va	do	1,473,500				1,473,500	
					9,385,550	2,670,000		400,000	12,455,550	As in other years, there was probably a very slight loss in transportation, though none was reported.
1876.	1876.									
May 8	May 24	Potomac River	Ferry Landing, Va	J. W. Milner	586,000	98,000	2,000		686,000	
May 9	May 12	Patuxent River	Bristol Landing, Md	W. H. Hines	175,000				175,000	
May 10	May 31	Chesapeake Bay	Carpenters Point, Md	W. F. Wroten	822,500	748,400	89,100		1,660,000	
May 26	June 3	Susquehanna River	Swan Creek, Md	W. H. Hines	80,000	45,000			125,000	
May 28	June 14	do	Havre de Grace, Md	F. N. Clark	272,000	453,000	137,000		862,000	
June 3	June 21	do	Fishing Battery, Md	W. Hamlen	459,000				459,000	
June 1	June 10	Chesapeake Bay	Swan Creek, Md	W. F. Wroten	200,000	325,000			525,000	
June 12	June 20	Susquehanna River	Havre de Grace, Md	W. H. Hines	125,000				125,000	
July 3	Aug. 5	Connecticut River	South Hadley Falls, Mass	A. D. Hagar	924,000	1,017,500	16,500		1,958,000	
					3,643,500	2,686,900	244,600		6,575,000	
1877.	1877.									
May 8	May 29	Susquehanna River	Havre de Grace, Md	T. B. Ferguson	4,982,500				4,982,500	
May 21	June 10	do	Spesutie Narrows, Md	do	739,800	2,856,000			3,595,800	
June 26	Aug. 6	Connecticut River	South Hadley Falls, Mass	J. W. Milner	917,000	1,688,000			2,605,000	
					6,639,300	4,544,000			11,183,300	There was probably some loss from the 4,544,000 said to have been transported, though none was reported by the messengers.
1878.	1878.									
Apr. 1	May 2	Roanoke River	Avoca, N. C	J. W. Milner	2,345,500	3,070,000	940,000		6,355,500	
May 15	June 4	Chesapeake Bay	Spesutie Narrows, Md	T. Hughlett	5,105,000	4,920,000			10,025,000	
May 23	June 4	Potomac River	Steamer Lookout	T. B. Ferguson	575,000	150,000			725,000	
					8,025,500	8,140,000	940,000		17,105,500	
1879.	1879.									
Apr. 18	May 14	Roanoke River	Avoca, N. C	S. G. Worth	875,000	4,065,000	1,110,000		6,050,000	
May 16	June 14	Chesapeake Bay	Spesutie Narrows, Md	T. B. Ferguson	4,587,000	5,517,500	142,500		10,247,000	
June 2	June 14	do	Old Bay Fishery, Md	do	125,000	420,000			545,000	
					5,587,000	10,002,500	1,252,500		16,842,000	
1880.	1880.									
May 7	June 15	Chesapeake Bay	Havre de Grace, Md	T. B. Ferguson	7,863,000	2,910,000	150,000		10,923,000	
May 7	June 27	Potomac River	Steamer Lookout	do	1,600	17,851,400	27,000	670,000	18,550,000	670,000 used at Washington for experiments.
					7,864,600	20,761,400	177,000	670,000	29,473,000	

RECAPITULATION.

Year.	Extreme limits of dates.	Number of stations.	Number of shad hatched by United States Fish Commission and released where they were hatched.	Transported by United States Fish Commission to other waters of the United States and there planted.	Number lost in attempting to transport in the United States.	Number hatched for miscellaneous purposes.	Total product of shad each year.
1872	June 30 to July 7	2	.....	859,000	1,196,000	.....	2,055,000
1873	Apr. 20 to July 22	7	1,848,000	1,155,000	20,000	.....	3,023,000
1874	June 24 to Aug. 15	3	530,000	3,031,000	15,000	100,000	3,676,000
1875	Apr. 14 to July 30	9	9,385,550	2,670,000	.....	400,000	12,455,550
1876	May 8 to Aug. 5	9	3,643,500	2,686,900	244,600	.....	6,575,000
1877	May 8 to Aug. 6	3	6,639,300	4,544,000	.....	.....	11,183,300
1878	Apr. 1 to June 14	3	8,025,500	8,140,000	940,000	.....	17,105,500
1879	Apr. 18 to June 14	3	5,587,000	10,002,500	1,252,500	.....	16,842,000
1880	May 7, o June 27	2	7,864,600	20,761,400	177,000	670,000	29,473,000
			43,523,450	53,849,800	3,845,100	1,170,000	102,388,350

B.—TABLE I.—*Table showing the number of eggs of California salmon* (salmo quinnat) *taken at the United States station, McCloud River, Baird, California, and the disposition made of them, 1872–1880, inclusive.*

I.—HATCHED AND PLANTED ON PACIFIC COAST.

States.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1872–1880.
California*	.....	20,000	850,000	2,230,000	1,800,000	2,450,000	2,500,000	2,500,000	2,810,000	15,160,000
Oregon	.....	.....	.....	.....	.....	300,000	.....	.....	.....	300,000
Total	.....	20,000	850,000	2,230,000	1,800,000	2,750,000	2,500,000	2,500,000	2,810,000	15,460,000

II.—CONSIGNED TO COMMISSIONERS OF STATES.

Colorado	.....	.....	25,000	240,000	300,000	.....	.....	.....	.....	565,000
Connecticut	.....	130,000	300,000	480,000	500,000	.....	.....	.....	.....	1,410,000
Illinois	.....	.....	50,000	80,000	250,000	150,000	400,000	.....	100,000	1,030,000
Iowa	.....	.....	300,000	300,000	.....	100,000	300,000	50,000	.....	1,050,000
Kansas	.....	.....	.....	.....	.....	100,000	100,000	100,000	100,000	400,000
Kentucky	.....	.....	.....	.....	200,000	155,000	.....	.....	.....	355,000
Maine	.....	50,000	150,000	.....	.....	.....	15,000	.....	.....	215,000
Maryland	.....	.....	375,000	560,000	1,210,000	400,000	1,000,000	700,000	400,000	4,645,000
Massachusetts	.....	50,000	200,000	80,000	210,000	200,000	.....	.....	.....	740,000
Michigan	.....	120,000	900,000	1,788,000	500,000	150,000	450,000	.....	.....	3,908,000
Minnesota	.....	.....	275,000	400,000	300,000	250,000	1,000,000	400,000	200,000	2,825,000
Missouri	.....	.....	.....	.....	.....	.....	200,000	.....	210,000	410,000
Nebraska	.....	.....	.....	.....	.....	10,000	100,000	200,000	400,000	710,000
Nevada	.....	.....	.....	.....	.....	.....	250,000	.....	.....	250,000
New Hampshire	.....	.....	.....	.....	.....	105,000	450,000	.....	.....	555,000
New Jersey	30,000	600,000	225,000	.....	.....	250,000	575,000	500,000	300,000	2,480,000
New York	.....	220,000	425,000	400,000	90,000	.....	.....	.....	.....	1,135,000
North Carolina	.....	.....	.....	.....	.....	350,000	350,000	200,000	200,000	1,100,000
Ohio	.....	.....	.....	.....	.....	250,000	50,000	200,000	.....	500,000
Pennsylvania	.....	170,000	450,000	480,000	515,000	275,000	250,000	300,000	.....	2,440,000
Rhode Island	.....	.....	100,000	240,000	.....	.....	.....	.....	.....	340,000
South Carolina	.....	.....	.....	.....	.....	.....	.....	50,000	200,000	250,000
Tennessee	.....	.....	.....	.....	100,000	.....	.....	.....	.....	100,000
Utah	.....	40,000	200,000	160,000	50,000	100,000	50,000	.....	.....	600,000
Virginia	.....	.....	50,000	320,000	.....	100,000	300,000	500,000	.....	1,270,000
West Virginia	.....	.....	.....	.....	.....	10,000	500,000	150,000	150,000	810,000
Wisconsin	.....	.....	80,000	80,000	100,000	320,000	220,000	300,000	.....	1,100,000
Total	30,000	1,380,000	4,105,000	5,608,000	4,325,000	3,275,000	6,569,000	3,650,000	2,260,000	31,193,000

* Including those hatched and deposited in the McCloud River.

B.—TABLE I.—*Table showing the number of eggs of California salmon, &c.*—Continued.

III.—CONSIGNED TO FOREIGN COUNTRIES.

Countries.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1872–1880.
Canada	.....	.....	25,000	80,000	10,000	150,000	500,000	100,000	50,000	915,000
England	.....	.....	.....	.....	.....	50,000	100,000	50,000	.....	200,000
France	.....	.....	.....	.....	.....	58,000	100,000	100,000	100,000	358,000
Holland	.....	.....	.....	.....	.....	100,000	100,000	100,000	200,000	500,000
Germany	.....	.....	.....	.....	.....	100,000	250,000	100,000	380,000	830,000
New Zealand	.....	.....	25,000	50,000	400,000	500,000	200,000	.....	.....	1,175,000
Australia	.....	.....	.....	.....	.....	50,000	.....	50,000	.....	100,000
Sandwich Islands	.....	.....	.....	.....	30,000	.....	.....	.....	.....	30,000
Total	.....	.....	50,000	130,000	440,000	1,008,000	1,250,000	500,000	730,000	4,108,000

RECAPITULATION.

California and Oregon	.....	20,000	850,000	2,230,000	1,800,000	2,750,000	2,500,000	2,500,000	2,810,000	15,460,000
Eastern States	30,000	1,380,000	4,105,000	5,608,000	4,325,000	3,275,000	6,560,000	3,650,000	2,260,000	31,193,000
Foreign	.....	.....	50,000	130,000	440,000	1,008,000	1,250,000	50,000	730,000	4,108,000
Total	30,000	1,400,000	5,005,000	7,968,000	6,565,000	7,033,000	10,310,000	6,650,000	5,800,000	50,761,000

B.—TABLE II.—*Table showing the success in transporting and hatching* 31,193,000 *eggs of California salmon* (Salmo quinnat) *taken from McCloud River, California, and consigned to commissioners of Eastern States,* 1872–1880.

I.—ARRANGED BY YEARS.

1872.

State to which consigned.	Number of eggs sent from McCloud River.	Received at State hatcheries.	Loss in hatching and transporting to waters.		Young actually introduced.	
			Number lost.	Per cent.	Number.	Per cent.
New Jersey	30,000	30,000	24,000	80	6,000	20
Total	30,000	30,000	24,000	80	6,000	20

1873.

Connecticut	130,000	110,000	89,000	89	21,000	11
Maine	50,000	50,000	5,000	10	45,000	90
Massachusetts	50,000	48,000	21,000	44	27,000	56
Michigan	120,000	80,000	2,000	3	78,000	97
New Jersey	600,000	600,000	50,000	8	550,000	92
New York	220,000	220,000	20,000	9	200,000	91
Pennsylvania	170,000	170,000	169,000	99	1,000	1
Utah	40,000	40,000	2,000	5	38,000	95
Total	1,380,000	1,318,000	358,000	27	960,000	73

1874.

Colorado	25,000	25,000	2,100	9	22,900	91
Connecticut	300,000	300,000	60,000	20	240,000	80
Illinois	50,000	50,000	15,000	30	35,000	70
Iowa	300,000	300,000	41,300	14	258,700	86
Maine	150,000	100,000	70,000	70	30,000	30
Maryland	375,000	250,000	106,000	42	144,000	58
Massachusetts	200,000	200,000	193,000	96	7,000	4
Michigan, I	750,000	750,000	150,000	20	600,000	80
Michigan, II	150,000	150,000	25,000	17	125,000	83
Minnesota, I	150,000	160,000	110,000	69	50,000	31
Minnesota, II[1]	125,000					
New Jersey	225,000	225,000	60,000	26	165,000	74
New York, I	400,000	400,000	80,990	20	319,010	80
New York, II[2]	95,000					
Pennsylvania	450,000	360,000	55,000	15	305,000	85
Rhode Island	100,000	100,000	35,000	35	65,000	65
Utah	200,000	200,000	14,000	7	186,000	93
Virginia[3]	50,000	50,000	25,000	50	25,000	50
Wisconsin	80,000	100,000	39,000	39	61,000	61
Total	4,155,000	3,720,000	1,081,390	29	2,638,610	71

1875.

Colorado	240,000	240,000	40,000	17	200,000	83
Connecticut	480,000	480,000	20,000	4	460,000	96
Illinois	80,000	80,000	21,300	27	58,700	73
Iowa	300,000	300,000	16,000	5	284,000	95
Maryland	560,000	560,000	291,236	52	268,764	48
Massachusetts	80,000	80,000	5,000	6	75,000	94
Michigan, I	800,000	800,000	32,000	4	768,000	96
Michigan, II[4]	988,000	988,000	235,300	24	752,700	76
Minnesota	400,000	400,000	100,000	25	300,000	75
New York	400,000	300,000	27,000	9	273,000	91
Pennsylvania	480,000	515,000	2,000	1	513,000	99
Rhode Island	240,000	120,000	5,000	4	115,000	96
Utah	160,000	160,000	40,000	25	120,000	75
Virginia	320,000	320,000	160,000	50	160,000	50
Wisconsin	80,000	80,000	40,000	50	40,000	50
Total	5,608,000	5,423,000	1,034,836	19	4,388,164	81

[1] Consigned to David Day, Saint Paul, and by him to Seth Green.
[2] Consigned to H. H. Thomas, Randolph, N. Y.
[3] Loss in hatching estimated.
[4] By F. N. Clark, on account of U. S. Fish Commission.

B.—TABLE II.—*Table showing the success in transporting and hatching* 31,193,000 *eggs, &c.*—Continued.

I.—ARRANGED BY YEARS—Continued.

1876.

State to which consigned.	Number of eggs sent from McCloud River.	Received at State hatcheries.	Loss in hatching and transporting to waters.		Young actually introduced.	
			Number lost.	Per cent.	Number.	Per cent.
Colorado	300,000	300,000	50,000	17	250,000	83
Connecticut	500,000	500,000	22,714	5	477,286	95
Illinois, I	100,000	100,000	80,000	80	20,000	20
Illinois, II	150,000	150,000	12,000	8	138,000	92
Kentucky	200,000	200,000	153,775	76	46,225	24
Maryland	1,210,000	1,100,000	148,000	13	952,000	87
Massachusetts, I	200,000	200,000	20,000	10	180,000	90
Massachusetts, II[1]	10,000					
Michigan[2]	500,000	500,000	99,100	20	400,900	80
Minnesota	300,000	300,000	152,900	51	147,100	49
New York	90,000	60,000	16,800	28	43,200	72
Pennsylvania	515,000	515,000	38,000	7	477,000	93
Tennessee[3]	100,000					
Utah	50,000	50,000	12,500	25	37,500	75
Wisconsin	100,000	100,000	22,600	23	77,400	77
Total	4,325,000	4,075,000	828,389	21	3,246,611	79

1877.

Illinois, I[4]	50,000	50,000	5,000	10	45,000	90
Illinois, II	50,000	50,000	20,000	40	30,000	60
Illinois, III	50,000	50,000	29,000	58	21,000	42
Iowa	100,000	100,000	10,000	10	90,000	90
Kansas	100,000	100,000	1,000	1	99,000	99
Kentucky, I[5]	150,000	150,000	78,500	52	71,500	48
Kentucky, II	5,000					
Maryland	400,000	380,000	91,400	24	288,600	74
Massachusetts	200,000	200,000	20,000	10	180,000	90
Michigan	150,000	100,000	16,000	16	84,000	84
Minnesota	250,000	167,500	28,850	17	138,650	83
Nebraska[6]	10,000					
New Hampshire	105,000	100,000	8,500	9	91,500	91
New Jersey	250,000	250,000	25,000	10	225,000	90
North Carolina	350,000	350,000	116,000	33	234,000	67
Ohio	250,000	250,000	25,000	10	225,000	90
Pennsylvania, I	75,000	75,000	37,500	50	37,500	50
Pennsylvania, II	200,000	200,000	60,000	30	140,000	70
Utah	100,000	100,000	25,000	25	75,000	75
Virginia	100,000	100,000	8,000	8	92,000	92
West Virginia	10,000	10,000	125	1	9,875	99
Wisconsin	320,000	320,000	120,000	37	200,000	63
Total	3,275,000	3,102,500	724,875	23	2,377,625	77

1878.

Illinois, I	100,000	100,000	10,000	10	90,000	90
Illinois, II[7]	100,000					
Illinois, III	200,000	200,000	160,000	80	40,000	20
Iowa	300,000	300,000	18,500	6	281,500	94
Kansas	100,000	100,000	5,000	5	95,000	95
Maine	15,000	15,000	2,300	15	12,700	85
Maryland	1,000,000	1,050,000	386,264	37	663,736	63
Michigan, I	250,000	250,000	34,579	14	215,421	86
Michigan, II[8]	200,000	250,000	25,000	10	225,000	90
Minnesota	1,000,000	1,000,000	959,000	96	41,000	4
Missouri	200,000	200,000	50,000	25	150,000	75
Nebraska[9]	100,000					
Nevada	250,000	250,000	50,000	20	200,000	80
New Hampshire	450,000	367,500	29,460	8	338,040	92
New Jersey	575,000	525,000	70,800	13	454,200	87
North Carolina	350,000	367,500	67,500	18	300,000	82
Ohio	50,000	50,000	2,500	5	47,500	95
Pennsylvania, I	100,000	100,000	25,000	25	75,000	75

[1] Boston Aquarium, for exhibition.
[2] By F. N. Clark, account of U. S. Fish Commission.
[3] Consigned to M. S. Rodgers, Knoxville, Tenn.
[4] Consigned to W. D. Andrews, Rockford, Ill.
[5] Industrial Exhibition, Louisville, Ky.
[6] Consigned to J. G. Romaine, South Bend, Nebr.
[7] Consigned to Dr. W. A. Pratt, Elgin, Ill.
[8] By F. N. Clark, account U. S. Fish Commission.
[9] Consigned to J. G. Romaine, South Bend, Nebr.

B.—TABLE II.—*Table showing the success in transporting and hatching 31,193,000 eggs, &c.*—Continued.

I.—ARRANGED BY YEARS—Continued.

1878—Continued.

State to which consigned.	Number of eggs sent from McCloud River.	Received at State hatcheries.	Loss in hatching and transporting to waters.		Young actually introduced.	
			Number lost.	Per cent.	Number.	Per cent.
Pennsylvania, II	150,000	150,000	14,000	9	136,000	91
Utah	50,000	75,000	21,000	28	54,000	72
Virginia	300,000	315,000	39,000	12	276,000	88
West Virginia	500,000	525,000	25,000	5	500,000	95
Wisconsin	220,000	230,000	30,000	13	200,000	87
Total	6,560,000	6,420,000	2,024,903	32	4,395,097	68

1879.

Iowa[1]	50,000	100,000	1,000	1	99,000	99
Kansas	100,000	100,000	10,000	10	90,000	90
Maryland, I	500,000	500,000	62,724	12	437,276	88
Maryland, II	200,000	200,000	43,400	21	156,600	79
Minnesota	400,000	400,000	376,000	94	24,000	6
Nebraska	200,000	200,000	10,000	5	190,000	95
New Jersey	500,000	500,000	80,000	16	420,000	84
North Carolina	200,000	200,000	146,000	73	54,000	27
Ohio	200,000	200,000	100,000	50	100,000	50
Pennsylvania, I	100,000	100,000	23,000	23	77,000	77
Pennsylvania, II	200,000	200,000	60,000	30	140,000	70
South Carolina	50,000	33,000	8,000	24	25,000	76
Virginia, I	400,000	400,000	112,000	28	288,000	72
Virginia, II	100,000	100,000	14,500	14	85,500	86
West Virginia	150,000	125,000	11,250	9	113,750	91
Wisconsin	300,000	300,000	48,800	16	251,200	84
Total	3,650,000	3,658,000	1,106,674	29	2,551,326	71

1880.

Illinois	100,000	100,000	10,000	10	90,000	90
Kansas	100,000	100,000	4,000	4	96,000	96
Maryland	400,000	400,000	46,577	12	353,423	88
Minnesota	200,000	200,000	25,000	12	175,000	88
Missouri, I	200,000	200,000	14,000	7	186,000	93
Missouri, II[2]	10,000					
Nebraska	400,000	400,000	100,000	25	300,000	75
New Jersey	300,000	300,000	20,571	7	279,429	93
North Carolina	200,000	200,000	40,000	20	160,000	80
South Carolina	200,000	300,000	113,000	37	187,000	63
West Virginia	150,000	125,000	11,250	9	113,750	91
Total	2,260,000	2,325,000	384,398	17	1,940,602	83

RECAPITULATION BY YEARS.

Years.	Number of eggs sent from McCloud River.	Received at State hatcheries.	Loss in hatching and transporting to waters.		Young actually introduced.	
			Number lost.	Per cent.	Number.	Per cent.
1872	30,000	30,000	24,000	80	6,000	20
1873	1,380,000	1,318,000	358,000	27	960,000	73
1874	4,105,000	3,720,000	1,081,390	29	2,638,610	71
1875	5,608,000	5,423,000	1,034,836	19	4,388,164	81
1876	4,325,000	4,075,000	828,389	21	3,246,611	79
1877	3,275,000	3,102,500	724,875	23	2,377,625	77
1878	6,560,000	6,420,000	2,024,903	32	4,395,097	68
1879	3,650,000	3,658,000	1,106,674	29	2,551,326	71
1880	2,260,000	2,325,000	384,398	17	1,940,602	83
	31,193,000	30,071,500	7,567,465	25	22,504,035	75

[1] Hatched in Iowa for State of Missouri.

[2] Consigned to J. Ed. Humes, Versailles, Morgan County, Missouri; all lost in transit.

B.—TABLE III.—*Table showing the success in transporting and hatching* 31,193,000 *eggs, &c.*—Continued.

II.—ARRANGED BY STATES.

Years.	Number of eggs sent from McCloud River.	Received at State hatcheries.	Loss in hatching and transporting to waters.		Young actually introduced.	
			Number lost.	Per cent.	Number.	Per cent.
1.—COLORADO.						
1874	25,000	25,000	2,100	9	22,900	91
1875[1]	240,000	245,000	40,000	17	200,000	83
1876	300,000	300,000	50,000	17	250,000	83
Total	565,000	565,000	92,100	16	472,900	84
2.—CONNECTICUT.						
1873	130,000	110,000	89,000	89	21,000	11
1874	300,000	300,000	60,000	20	240,000	80
1875	480,000	480,000	20,000	4	460,000	96
1876	500,000	500,000	22,714	5	477,286	95
Total	1,410,000	1,390,000	191,714	13	1,198,286	87
3.—ILLINOIS.						
1874	50,000	50,000	15,000	30	35,000	70
1875	80,000	80,000	21,300	27	58,700	73
1876, I	100,000	100,000	80,000	80	20,000	20
1876, II	150,000	150,000	12,000	8	138,000	92
1877, I	50,000	50,000	5,000	10	45,000	90
1877, II	50,000	50,000	20,000	40	30,000	60
1877, III	50,000	50,000	29,000	58	21,000	42
1878, I	100,000	100,000	10,000	10	90,000	90
1878, II[2]	100,000					
1878, III	200,000	200,000	160,000	80	40,000	20
1880	100,000	100,000	10,000	10	90,000	90
Total	1,030,000	930,000	362,300	39	567,700	61
4.—IOWA.						
1874	300,000	300,000	41,300	14	258,700	86
1875	300,000	300,000	16,000	5	284,000	95
1877	100,000	100,000	10,000	10	90,000	90
1878	300,000	300,000	18,500	6	281,500	94
1879[3]	50,000	100,000	1,000	1	99,000	99
Total	1,050,000	1,100,000	86,800	8	1,013,200	92
5.—KANSAS.						
1877	100,000	100,000	1,000	1	99,000	99
1878	100,000	100,000	5,000	5	95,000	95
1879	100,000	100,000	10,000	10	90,000	90
1880	100,000	100,000	4,000	4	96,000	96
Total	400,000	400,000	20,000	5	380,000	95
6.—KENTUCKY.						
1876	200,000	200,000	153,775	76	46,225	24
1877, I	150,000	150,000	78,500	52	71,500	48
1877, II[4]	5,000					
Total	355,000	350,000	232,275	66	117,725	34
7.—MAINE.						
1873	50,000	50,000	5,000	10	45,000	90
1874	150,000	100,000	70,000	70	30,000	30
1878	15,000	15,000	2,300	15	12,700	85
Total	215,000	165,000	77,300	47	87,700	53
8.—MARYLAND.						
1874	375,000	250,000	106,000	42	144,000	58
1875	560,000	560,000	291,236	52	268,764	48
1876	1,210,000	1,100,000	148,000	13	952,000	87
1877	400,000	380,000	91,400	24	288,600	74
1878	1,090,000	1,050,000	386,264	37	663,736	63
1879, I	500,000	500,000	62,724	12	437,276	88
1879, II	200,000	200,000	43,400	21	156,600	79
1880	400,000	400,000	46,577	12	353,423	88
Total	4,645,000	4,440,000	1,175,601	29	3,264,399	71

[1] Consigned to W. H. Cushman, Georgetown, Colo.
[2] Consigned to Dr. W. A. Pratt, Elgin, Ill.
[3] Hatched in Iowa for State of Missouri.
[4] Industrial Exhibition, Louisville, Ky.

B.—TABLE III.—*Table showing the success in transporting and hatching 31,193,000 eggs, &c.*—Continued.

II.—ARRANGED BY STATES—Continued.

Years.	Number of eggs sent from McCloud River.	Received at State hatcheries.	Loss in hatching and transporting to waters.		Young actually introduced.	
			Number lost.	Per cent.	Number.	Per cent.
9.—MASSACHUSETTS.						
1873	50,000	48,000	21,000	44	27,000	56
1874	200,000	200,000	193,000	96	7,000	4
1875	80,000	80,000	5,000	6	75,000	94
1876, I	200,000	200,000	20,000	10	180,000	90
1876, II[1]	10,000					
1877	200,000	200,000	20,000	10	180,000	90
Total	740,000	728,000	259,000	36	469,000	64
10.—MICHIGAN.						
1873	120,000	80,000	2,000	3	78,000	97
1874, I	755,000	750,000	150,000	20	600,000	80
1874, II	150,000	150,000	25,000	17	125,000	83
1875, I	800,000	800,000	32,000	4	768,000	96
1875, II	988,000	988,000	235,300	24	752,700	76
1876	500,000	500,000	99,100	20	400,900	80
1877	150,000	100,000	16,000	16	84,000	84
1878, I	250,000	250,000	34,579	14	215,421	86
1878, II[2]	200,000	250,000	25,000	10	225,000	90
Total	3,908,000	3,868,000	618,979	16	3,249,021	84
11.—MINNESOTA.						
1874, I	150,000	160,000	110,000	69	50,000	31
1874, II[3]	125,000					
1875	400,000	400,000	100,000	25	300,000	75
1876	300,000	300,000	152,900	51	147,100	49
1877	250,000	167,500	28,850	17	138,650	83
1878	1,000,000	1,000,000	959,000	96	41,000	4
1879	400,000	400,000	376,000	94	24,000	6
1880	200,000	200,000	25,000	12	175,000	88
Total	2,825,000	2,627,500	1,751,750	64	875,750	36
12.—MISSOURI.						
1878[4]	200,000	200,000	50,000	25	150,000	75
1880, I	200,000	200,000	14,000	7	186,000	93
1880, II[5]	10,000					
Total	410,000	400,000	64,000	16	336,000	84
13.—NEBRASKA.						
1877[6]	10,000					
1878[6]	100,000					
1879	200,000	200,000	10,000	5	190,000	95
1880	400,000	400,000	100,000	25	300,000	75
Total	710,000	600,000	110,000	18	490,000	82
14.—NEVADA.						
1878	250,000	250,000	50,000	20	200,000	80
Total	250,000	250,000	50,000	20	200,000	80
15.—NEW HAMPSHIRE.						
1877	105,000	100,000	8,500	9	91,500	91
1878	450,000	367,500	29,460	8	338,040	92
Total	555,000	467,500	37,960	8	429,540	92
16.—NEW JERSEY.						
1872	30,000	30,000	24,000	80	6,000	20
1873	600,000	600,000	50,000	8	550,000	92
1874	225,000	225,000	60,000	26	165,000	74
1877	250,000	250,000	25,000	10	225,000	90
1878	575,000	525,000	70,800	13	454,200	87
1879	500,000	500,000	80,000	16	420,000	84
1880	300,000	300,000	20,571	7	279,429	93
Total	2,480,000	2,430,000	330,371	14	2,099,629	86

[1] Boston Aquarium, for exhibition.
[2] By Frank N. Clark, account of U. S. Fish Commission.
[3] Consigned to David Day, Saint Paul, Minn., and by him to Seth Green.
[4] Hatched for Missouri at Anamosa, Iowa.
[5] Consigned to J. Ed. Humes, Versailles, Morgan County, Mo.; all lost in transit.
[6] Consigned to J. G. Romaine, South Bend, Nebr.

B.—TABLE III.—*Table showing the success in transporting and hatching 31,192,000 eggs, &c.*—Continued.

II.—ARRANGED BY STATES—Continued.

Years.	Number of eggs sent from McCloud River.	Received at State hatcheries.	Loss in hatching and transporting to waters.		Young actually introduced.	
			Number lost.	Per cent.	Number.	Per cent.
17.—NEW YORK.						
1873	220,000	220,000	20,000	9	200,000	91
1874, I	400,000	400,000	80,990	20	319,010	80
1874, II	25,000					
1875	400,000	300,000	27,000	9	273,000	91
1876	90,000	60,000	16,800	28	43,200	72
Total	1,135,000	980,000	144,790	15	835,210	85
18.—NORTH CAROLINA.						
1877	350,000	350,000	116,000	33	234,000	67
1878	350,000	367,500	67,500	18	300,000	82
1879	200,000	200,000	146,000	73	54,000	27
1880	200,000	200,000	40,000	20	160,000	80
Total	1,100,000	1,117,500	369,500	33	748,000	67
19.—OHIO.						
1877	250,000	250,000	25,000	10	225,000	90
1878	50,000	50,000	2,500	5	47,500	95
1879	200,000	200,000	100,000	50	100,000	50
Total	500,000	500,000	127,500	26	372,500	74
20.—PENNSYLVANIA.						
1873	170,000	170,000	169,000	99	1,000	1
1874	450,000	360,000	55,000	15	305,000	85
1875	480,000	515,000	2,000	1	513,000	99
1876	515,000	515,000	38,000	7	477,000	93
1877, I	75,000	75,000	37,500	50	37,500	50
1877, II	200,000	200,000	60,000	30	140,000	70
1878, I	100,000	100,000	25,000	25	75,000	75
1878, II	150,000	150,000	14,000	9	136,000	91
1879, I	100,000	100,000	23,000	23	77,000	77
1879, II	200,000	200,000	60,000	30	140,000	70
Total	2,440,000	2,385,000	483,500	20	1,901,500	80
21.—RHODE ISLAND.						
1874	100,000	100,000	35,000	35	65,000	65
1875	240,000	120,000	5,000	4	115,000	96
Total	340,000	220,000	40,000	18	180,000	82
22.—SOUTH CAROLINA.						
1879	50,000	33,000	8,000	24	25,000	76
1880	200,000	300,000	113,000	37	187,000	80
Total	250,000	333,000	121,000	36	212,000	64
23.—TENNESSEE.						
1876[2]	100,000					
Total	100,000					
24.—UTAH.						
1873	40,000	40,000	2,000	5	38,000	95
1874	200,000	200,000	14,000	7	186,000	93
1875	160,000	160,000	40,000	25	120,000	75
1876	50,000	50,000	12,500	25	37,500	75
1877	100,000	100,000	25,000	25	75,000	75
1878	50,000	75,000	21,000	28	54,000	72
Total	600,000	625,000	114,000	18	510,500	82
25.—VIRGINIA.						
1874[3]	50,000	50,000	25,000	50	25,000	50
1875	320,000	320,000	160,000	50	160,000	50
1877	100,000	100,000	8,000	8	92,000	92
1878	300,000	315,000	39,000	12	276,000	88
1879, I	400,000	400,000	112,000	28	288,000	72
1879, II	100,000	100,000	14,500	14	85,500	86
Total	1,270,000	1,285,000	358,500	28	926,500	72

[1] Consigned to H. H. Thomas, Randolph, N. Y.
[2] Consigned to M. S. Rodgers, Knoxville, Tenn.
[3] Loss in hatching estimated.

B.—TABLE III.—*Table showing the success in transporting and hatching* 31,193,000 *eggs, &c.*—Continued.

II.—ARRANGED BY STATES—Continued.

Years.	Number of eggs sent from McCloud River.	Received at State hatcheries.	Loss in hatching and transporting to waters.		Young actually introduced.	
			Number lost.	Per cent.	Number.	Per cent.
26.—WEST VIRGINIA.						
1877	10,000	10,000	125	1	9,875	99
1878	500,000	525,000	25,000	5	500,000	95
1879	150,000	125,000	11,250	9	113,750	91
1880	150,000	125,000	11,250	9	113,750	91
Total	810,000	785,000	47,625	6	737,375	94
27.—WISCONSIN.						
1874	80,000	100,000	39,000	39	61,000	61
1875	80,000	80,000	40,000	50	40,000	50
1876	100,000	100,000	22,600	23	77,400	77
1877	320,000	320,000	120,000	37	200,000	63
1878	220,000	230,000	30,000	13	200,000	87
1879	300,000	300,000	48,800	16	251,200	84
Total	1,100,000	1,130,000	300,400	27	829,600	73

RECAPITULATION BY STATES.

Number.	State to which consigned.	Number of eggs sent from McCloud River.	Received at State hatcheries.	Loss in hatching and transporting to waters.		Young actually introduced.	
				Number lost.	Per cent.	Number.	Per cent.
1	Colorado	565,000	565,000	92,100	16	472,900	84
2	Connecticut	1,410,000	1,390,000	191,714	13	1,198,286	87
3	Illinois	1,030,000	930,000	362,300	39	567,700	61
4	Iowa	1,050,000	1,100,000	86,800	8	1,013,200	92
5	Kansas	400,000	400,000	20,000	5	380,000	95
6	Kentucky	355,000	350,000	232,275	66	117,725	34
7	Maine	215,000	165,000	77,300	47	87,700	53
8	Maryland	4,645,000	4,440,000	1,175,601	29	3,264,399	71
9	Massachusetts	740,000	728,000	259,000	36	469,000	64
10	Michigan	3,908,000	3,868,000	618,979	16	3,249,021	84
11	Minnesota	2,825,000	2,627,500	1,751,750	64	875,750	36
12	Missouri	410,000	400,000	64,000	16	336,000	84
13	Nebraska	710,000	600,000	110,000	18	490,000	82
14	Nevada	250,000	250,000	50,000	20	200,000	80
15	New Hampshire	555,000	467,500	37,960	8	429,540	92
16	New Jersey	2,480,000	2,430,000	330,371	14	2,099,629	84
17	New York	1,135,000	980,000	144,790	15	835,210	85
18	North Carolina	1,100,000	1,117,500	369,500	33	748,000	67
19	Ohio	500,000	500,000	127,500	26	372,500	74
20	Pennsylvania	2,440,000	2,385,000	483,500	20	1,901,500	80
21	Rhode Island	340,000	220,000	40,000	18	180,000	82
22	South Carolina	250,000	333,000	121,000	36	212,000	64
23	Tennessee	100,000	(*)	(*)	(*)	(*)	(*)
24	Utah	600,000	625,000	114,500	18	510,500	82
25	Virginia	1,270,000	1,285,000	358,500	28	926,500	72
26	West Virginia	810,000	785,000	47,625	6	737,375	94
27	Wisconsin	1,100,000	1,130,000	300,400	27	829,600	73
	Total	31,193,000	30,071,500	7,567,465	25	22,504,035	75

* No report received.

C.—TABLE I.—*Summary table of the number of shad* (Alosa sapidissima) *introduced into the waters of the different States by the United States Fish Commission, 1872–1880, inclusive.*

[NOTE.—Nearly all of these fish were not only introduced but also hatched by the United States Fish Commission.]

States.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	Total.
Alabama					90,000	75,000	265,000	340,000		771,000
Arkansas					79,200	80,000	100,000	125,000		384,200
California		35,000			99,000	100,000	150,000		215,000	599,000
Colorado	2,000									2,000
Connecticut		90,000	280,000	100,000						470,000
Delaware						100,000		195,000	1,350,000	1,645,000
District of Columbia							400,000	160,000	7,655,000	8,215,000
Florida								120,000		120,000
Georgia				60,000	243,200	410,000	320,000	562,500	1,188,000	2,783,700
Illinois		70,000	70,000	60,000			300,000			500,000
Indiana	400,000	40,000	315,000	100,000			165,000	150,000	200,000	1,370,000
Iowa			100,000	90,000	148,500		100,000			438,500
Kansas						100,000		160,000		260,000
Kentucky						160,000	395,000	350,000	700,000	1,605,000
Louisiana				60,000			100,000	200,000		360,000
Maine		100,000	300,000	100,000		85,000			675,000	1,260,000
Maryland				1,182,500	2,311,500	7,319,300	7,485,000	7,057,000	14,323,000	39,678,300
Massachusetts			350,000	5,225,000	459,000	1,077,000				7,111,000
Michigan		210,000	160,000							370,000
Minnesota	25,000		100,000			100,000				225,000
Mississippi				100,000	148,000	100,000	614,000	375,000		1,337,000
Missouri	1,000				300,000	400,000	220,000	350,000	200,000	1,471,000
New Hampshire						125,000				125,000
New York	430,000									430,000
North Carolina		45,000			164,900	434,000	3,434,500	3,200,000		7,278,400
Ohio	1,000	50,000	325,000	175,000	134,700		60,000	100,000	200,000	1,045,700
Pennsylvania		448,000	530,000					140,000	450,000	1,568,000
Rhode Island			36,000	50,000		100,000				186,000
South Carolina				80,000	50,000		100,000	75,000	1,310,000	1,615,000
Tennessee				260,000	396,800	118,000	100,000	285,000		1,159,800
Texas			60,000	60,000				575,000		695,000
Utah		5,000								5,000
Vermont		400,000	935,000	550,000	645,000	90,000				2,620,000
Virginia		1,410,000		3,803,050	860,600	110,000	1,856,000	545,000	160,000	8,744,650
West Virginia		30,000			200,000			525,000		755,000
Wisconsin		70,000				100,000				170,000
Total	859,000	3,003,000	3,561,000	12,055,550	6,330,400	11,183,300	16,165,500	15,589,500	28,626,000	97,373,250

RECAPITULATION, 1872–1880, INCLUSIVE.

Hatched and returned to same waters	43,523,450	
Transported and planted in new waters	53,849,800	
		97,373,250
Lost in efforts to transport in the United States		3,845,100
Lost in efforts to transport to Germany		500,000
Used for experiments		670,000
Grand total of shad hatched artificially by United States Fish Commission		102,388,350

NOTE.—The figures in this and the following five tables are made to agree with those in the six specific lists of distribution which follow under D. For 1880, the returns were not complete when these tables were made up, and hence the figures are somewhat too small. They should be corrected by means of the various tables in the report for that year.

C.—TABLE II.—*Summary table of the number of California salmon* (Salmo quinnat) *introduced into the waters of the different States, as specified in the tables of waters, having been hatched from eggs taken by the United States Fish Commission, 1872–1880, inclusive.*

States.	From eggs of 1872.	From eggs of 1873.	From eggs of 1874.	From eggs of 1875.	From eggs of 1876.	From eggs of 1877.	From eggs of 1878.	From eggs of 1879.	From eggs of 1880.	Total decade.
Alabama					28,600		2,000			30,600
Arkansas							11,000			11,000
California		500,000	500,000	850,000	1,520,000	3,200,000	3,733,000	2,000,000	2,000,000	14,273,000
Colorado			22,900							22,900
Connecticut		11,000	284,700	460,000	477,286					1,232,986
Delaware					10,400				11,000	21,400
Georgia					50,000		29,000			79,000
Illinois			80,000	38,700	160,500	61,000	90,000			430,200
Indiana			31,000	319,000	93,500					443,500
Iowa			258,700		25,000		281,500			565,200
Kansas						99,000	97,000	97,000	96,000	389,000
Kentucky				25,000	46,475	71,500				142,975
Louisiana			15,000		28,200					43,200
Maine		5,000	30,000				12,700			47,700
Maryland			129,600	265,264	789,340	288,100	592,936	572,276	354,223	2,991,139
Massachusetts		27,000	7,000	75,000	90,000	89,100				288,100
Michigan		76,230	306,600	784,700		75,400	215,421			1,458,351
Minnesota			27,700	216,375	149,630	139,600	42,000	25,200		600,505
Mississippi					71,800					71,800
Missouri					31,000		150,000	190,000	175,000	546,000
Nevada							200,000			200,000
New Hampshire					100,000	100,000	367,000			567,000
New Jersey		375,000	5,000		58,000	67,000	448,000	420,000	279,429	1,652,429
New York		277,000	304,000	187,000	27,200					795,200
North Carolina					18,500	229,000	297,500	54,400	160,000	759,400
Ohio		46,000	10,000	150,000	50,000	220,000	44,000	100,000		620,000
Pennsylvania	6,000	76,000	183,000	513,000	478,000	174,000	210,000	217,000		1,857,000
Rhode Island			68,000	115,000						183,000
South Carolina					11,000		29,000	31,000		71,000
Tennessee				40,000	38,000					78,000
Texas			14,000	180,000	20,000					214,000
Utah		38,000	195,900	112,000	34,200	75,000				455,100
Vermont		35,000								35,000
Virginia		45,000	30,000	160,000	148,400	92,000	276,000	373,500		1,124,900
West Virginia					33,000	9,875	523,000	227,000		792,875
Wisconsin			29,000	47,000	75,000	137,300	200,000	251,200	90,000	829,500
Total	6,000	1,511,230	2,531,500	4,538,039	4,663,031	5,127,875	7,821,057	4,558,576	3,165,652	33,922,960

C.—TABLE III.—*Summary table of the number of Schoodic salmon* (Salmo salar *subs.* sebago) *introduced into the waters of the different States by the United States Fish Commission, 1873–1880, inclusive.*

State.	From eggs of 1873.	From eggs of 1874.	From eggs of 1875.	From eggs of 1876.	From eggs of 1877.	From eggs of 1878.	From eggs of 1879.	Total.
California					39,950			39,950
Connecticut			135,000	62,500	165,000	178,715	91,000	632,215
Illinois					4,400			4,400
Indiana					25,000		10,000	35,000
Iowa					20,000			20,000
Kansas						20,000	93,000	113,000
Kentucky					5,500			5,500
Maine	2,000		250,000	110,000	497,200	449,500		1,308,700
Maryland					40,081	26,500	16,900	83,481
Massachusetts			195,000	151,200	218,000	221,000	176,000	961,200
Michigan	2,000		20,000		29,500		20,000	71,500
Minnesota		4,750		7,750	8,000	48,500		69,000
New Hampshire					20,000	104,000	61,400	185,400
New Jersey					58,000	66,794		124,794
New York					2,000	39,000		41,000
North Carolina					15,500			15,500
Ohio			34,000		12,000	6,000		52,000
Pennsylvania					48,494	35,500	18,500	102,494
Rhode Island			19,600		9,500			29,100
South Carolina							15,000	15,000
Vermont			40,000		24,000			64,000
Virginia		2,500		10,500	40,300	27,350	23,500	104,150
West Virginia					8,500	44,419		52,919
Wisconsin			38,000		5,000	37,000		80,000
Total	4,000	7,250	731,600	341,950	1,295,925	1,304,278	525,300	4,210,303

C.—TABLE IV.—*Summary table of the number of Penobscot salmon* (Salmo salar) *introduced into the waters of the different States by the United States Fish Commission, 1872–1880, inclusive.*

State.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	Total.
California			305							305
Connecticut		73,937		115,000		97,500				286,437
Illinois			25,000	19,000						44,000
Iowa				70,000	70,000					140,000
Maine		154,750	228,613	209,000	320,000					912,363
Maryland				72,800					58,729	131,529
Massachusetts		24,310	47,000		50,000					121,310
Michigan		14,900	112,000	5,000						131,900
Minnesota				24,600						24,600
New Hampshire		14,500	162,000	80,000	200,000					456,500
New Jersey		33,000	168,000	79,000				20,572		300,572
New York		62,500		125,000						187,500
Ohio		2,500		50,000						52,500
Pennsylvania		10,000	25,000	137,000					23,000	195,000
Rhode Island			6,400	59,000	15,000	125,000				205,400
Vermont			7,000	221,000	71,500					299,500
Wisconsin		19,000	15,000	20,000						54,000
Total		10,000	437,797	1,174,918	955,900	765,000	97,500	20,572	81,729	3,543,416

C.—TABLE V.—*Summary table of the number of white-fish* (Coregonus albus) *introduced into the waters of the different States by the United States Fish Commission*, 1872–1880, *inclusive.*

State.	1872.	1873.	1874	1875.	1876.	1877.	1878.	1879.	1880.	Total.
California	25,000	25,000	.....	20,000	.....	300,000	.....	565,000	.....	935,000
Indiana	.....	.....	.....	.....	100,000	.....	.....	.....	.....	100,000
Iowa	.....	.....	.....	.....	100,000	.....	.....	.....	.....	100,000
Michigan	.....	.....	.....	.....	1,470,000	.....	.....	.....	200,000	1,670,000
New Jersey	.....	.....	.....	.....	.....	.....	.....	90,000	.....	90,000
Ohio	.....	.....	.....	.....	600,000	.....	.....	.....	.....	600,000
Wisconsin	.....	.....	.....	100,000	100,000	.....	.....	.....	.....	200,000
Total	25,000	25,000	.....	120,000	2,370,000	300,000	.....	655,000	200,000	3,695,000

C.—TABLE VI.—*Summary table of the number of California trout* (Salmo iridens) *introduced into the waters of the different States by the United States Fish Commission*, 1880.

State.	1880.
Illinois	2,500
Iowa	1,000
Maryland	22,500
Michigan	5,102
Minnesota	1,900
New Hampshire	2,000
North Carolina	4,300
Pennsylvania	700
South Carolina	3,500
West Virginia	500
Total	44,002

Recapitulation of young fish introduced into waters of the United States by the United States Fish Commission, 1872–1880, *inclusive.*

Table I.	Shad	102,388,350
" II.	California salmon	33,922,960
" III.	Schoodic salmon	4,210,303
" IV.	Penobscot salmon	3,643,416
" V.	White fish	3,695,000
" VI.	California trout	44,002
	Total	147,804,031

In addition to the above there were carp distributed in 1879 and 1880 to the number of 61,410; for the particulars of which see Report of 1880, pp. xli and xlii.

D.—TABLE I.—*Distribution of shad from 1872 to 1880, inclusive.*

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where fish were hatched.	By whom transferred.	Estimated number of fish.
Alabama	July 11, 1876	Montgomery, Ala	Alabama River	Mobile River	South Hadley Falls, Mass	Kumlien and Bean	90,000
	May 29, 1877	Montgomery, Ala	Tallapoosa River	Alabama River	Spesutie Narrows, Md	L. Kumlien	75,000
	Apr. 13, 1878	Demopolis, Ala	Tombigbee River	Mobile River	Avoca, N. C	J. F. Ellis	116,000
	May 24, 1878	Pollard, Ala	Escambia River	Pensacola Bay	Havre de Grace, Md	F. A. Ingalls	100,000
	June 9, 1878	Salisbury, Ala	Tallapoosa River	Alabama River	Havre de Grace, Md	J. M. Donaldson	50,000
	May 13, 1879	Union Springs, Ala	Pea River	Choctawhatchee River	Avoca, N. C	L. Kumlien	90,000
	May 13, 1879	Union Springs, Ala	Conecha River	Escambia River	Avoca, N. C	L. Kumlien	85,000
	June 13, 1879	Lebanon, Ala	Big Wills Creek	Coosa River	Old Bay Fishery, Md	J. F. Ellis	45,000
	June 13, 1879	Tuscaloosa, Ala	Black Warrior River	Tombigbee River	Old Bay Fishery, Md	J. F. Ellis	45,000
	May 13, 1879	Columbia, Ala	Tombigbee River	Mobile Bay	Old Bay Fishery, Md	C. W. Schuermann	75,000
Arkansas	Aug. 7, 1876	Newport, Ark	White River	Mississippi River	South Hadley Falls, Mass	Anderson and Smith	79,200
	July 14, 1877	Fulton, Ark	Red River	Mississippi River	South Hadley Falls, Mass	R. E. Earll	80,000
	June 1, 1878	Benton, Ark	Saline River	Washita River	Havre de Grace, Md	H. E. Quinn	50,000
	June 1, 1878	Arkadelphia, Ark	Caddo River	Washita River	Havre de Grace, Md	H. E. Quinn	50,000
	June 11, 1879	White County, Ark	Little Red River	White River	Old Bay Fishery, Md	W. M. Russ	20,000
	June 11, 1879	Saline County, Ark	Saline River	Washita River	Old Bay Fishery, Md	W. M. Russ	25,000
	June 11, 1879	Clark County, Ark	Ouachita River	Black River	Old Bay Fishery, Md	W. M. Russ	40,000
	June 11, 1879	Fulton, Ark	Red River	Mississippi River	Old Bay Fishery, Md	W. M. Russ	40,000
California	July 2, 1873	Tehama, Cal	Sacramento River	San Francisco Bay	Coeymans, N. Y	Livingston Stone and H. W. Welsher.	35,000
	Aug. 8, 1876	Tehama, Cal	Sacramento River	San Francisco Bay	South Hadley Falls, Mass	Clark and Bean	99,000
	June 6, 1877	Tehama, Cal	Sacramento River	San Francisco Bay	Spesutie Narrows, Md	F. N. Clark	100,000
	June 11, 1878	Tehama, Cal	Sacramento River	San Francisco Bay	Havre de Grace, Md	F. N. Clark	150,000
	June 18, 1880	Tehama, Cal	Sacramento River	San Francisco Bay	Potomac Station	Ellis and Davenport	215,000
Colorado	July 7, 1872	Denver, Colo	Platte River	Missouri River	South Hadley Falls, Mass	Rev. Wm. Cliff	2,000
Connecticut	July 8, 1873	New Milford, Conn	Housatonic River	Naugatuck River	South Hadley Falls, Mass	J. W. Milner and J. Mason.	90,000
	July 22, 1874	Noank, Conn	(Used for experiments)		South Hadley Falls, Mass	Mather and Veeley	20,000
	July 23, 1874	Putnam, Conn	Thames River	Long Island Sound	South Hadley Falls, Mass	Mather and Veeley	110,000
	Aug. 3, 1874	New Milford, Conn	Housatonic River	Naugatuck River	South Hadley Falls, Mass	F. N. Clark	100,000
	Aug. 15, 1874	Noank, Conn	(Used for experiments)		South Hadley Falls, Mass	C. D. Griswold	50,000
	July 9, 1875	Canterbury, Conn	Quinnebaug River	Thames River	South Hadley Falls, Mass	H. E. Quinn	100,000
Delaware	June 12, 1877	Seaford, Del	Nanticoke River	Chesapeake Bay	Spesutie Narrows, Md	J. W. Milner	100,000
	May 24, 1879	Seaford, Del	Nanticoke River	Chesapeake Bay	Spesutie Narrows, Md	Thomas Hughlett, jr.	20,000
	June 13, 1879	Blackbird, Del	Appoquiminink Creek	Delaware Bay	Old Bay Fishery, Md	Thomas Hughlett, jr	50,000
	June 13, 1879	Clayton, Del	Duck Creek	Delaware Bay	Old Bay Fishery, Md	Thomas Hughlett, jr	25,000
	June 13, 1879	Milford, Del	Mispillion Creek	Delaware Bay	Old Bay Fishery, Md	Thomas Hughlett, jr	100,000
	May 25, 1880	Seaford, Del	Nanticoke River	Chesapeake Bay	Havre de Grace, Md	N. Simmons	1,050,000
	May 25, 1880	Wilmington, Del	Christiana Creek	Delaware River	Havre de Grace, Md	N. Simmons	120,000
	May 25, 1880	Dover, Del	Jones Creek	Delaware Bay	Havre de Grace, Md	N. Simmons	180,000
District of Columbia.	May 27, 1878	Washington, D. C	Potomac River	Chesapeake Bay	Havre de Grace, Md	U. S. Fish Commission	400,000
	June 11, 1879	Georgetown, D. C	Little Falls of Potomac River.	Chesapeake Bay	Spesutie Narrows, Md	J. F. Ellis	160,000

D.—TABLE I.—*Distribution of shad from* 1872 *to* 1880, *inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where fish were hatched.	By whom transferred.	Estimated number of fish.
District of Columbia — Continued.	May 8, 1880	Washington, D. C.	East Branch of Potomac River.	Potomac River	Potomac Station	William P. Sauerhoff	335,000
	May 9, 1880	Washington, D. C.	East Branch of Potomac River.	Potomac River	Potomac Station	William P. Sauerhoff	50,000
	May 11, 1880	Washington, D. C.	East Branch of Potomac River.	Potomac River	Potomac Station	C. W. Schuermann	110,000
	May 15, 1880	Washington, D. C.	Potomac River	Chesapeake Bay	Potomac Station	C. W. Schuermann	60,000
	May 16, 1880	Washington, D. C.	East Branch of Potomac River.	Potomac River	Potomac Station	C. W. Schuermann	20,000
	May 17, 1880	Washington, D. C.	East Branch of Potomac River.	Potomac River	Potomac Station	C. W. Schuermann	100,000
	May 18, 1880	Washington, D. C.	East Branch of Potomac River.	Potomac River	Potomac Station	C. W. Schuermann	200,000
	May 20, 1880	Washington, D. C.	East Branch of Potomac River.	Potomac River	Potomac Station	Sauerhoff & Hamlen	400,000
	May 21, 1880	Washington, D. C.	East Branch of Potomac River.	Potomac River	Potomac Station	Sauerhoff & Hamlen	200,000
	May 22, 1880	Washington, D. C.	East Branch of Potomac River.	Potomac River	Potomac Station	C. W. Schuermann	600,000
	May 24, 1880	Washington, D. C.	East Branch of Potomac River.	Potomac River	Potomac Station	Clark and Schuermann	800,000
	May 25, 1880	Washington, D. C.	East Branch of Potomac River.	Potomac River	Potomac Station	F. N. Clark	400,000
	May 26, 1880	Washington, D. C.	East Branch of Potomac River.	Potomac River	Potomac Station	C. W. Schuermann	400,000
	May 27, 1880	Washington, D. C.	East Branch of Potomac River.	Potomac River	Potomac Station	F. N. Clark	450,000
	May 28, 1880	Washington, D. C.	East Branch of Potomac River.	Potomac River	Potomac Station	F. N. Clark	150,000
	May 29, 1880	Washington, D. C.	East Branch of Potomac River.	Potomac River	Potomac Station	F. N. Clark	200,000
	June 1, 1880	Washington, D. C.	East Branch of Potomac River.	Potomac River	Potomac Station	F. N. Clark	30,000
	June 4, 1880	Georgetown, D. C.	Little Falls of Potomac River.	Chesapeake Bay	Potomac Station	F. N. Clark	500,000
	June 4, 1880	Washington, D. C.	East Branch of Potomac River.	Potomac River	Potomac Station	F. N. Clark	175,000
	June 5, 1880	Georgetown, D. C.	Little Falls of Potomac River.	Chesapeake Bay	Potomac Station	William H. Jenkins	600,000
	June 5, 1880	Washington, D. C.	East Branch of Potomac River.	Potomac River	Potomac Station	F. N. Clark	300,000
	June 6, 1880	Washington, D. C.	East Branch of Potomac River.	Potomac River	Potomac Station	F. N. Clark	300,000

	June 8, 1880	Georgetown, D. C	Little Falls of Potomac River.	Chesapeake Bay	Potomac Station	S. M. Rixey	400,000
	June 12, 1880	Washington, D. C	East Branch of Potomac River.	Potomac River	Potomac Station	F. N. Clark	75,000
	June 12, 1880	Georgetown, D. C	Little Falls of Potomac River.	Chesapeake Bay	Potomac Station	W. H. Jenkins, jr	500,000
	June 13, 1880	Washington, D. C	East Branch of Potomac River.	Potomac River	Potomac Station	F. N. Clark	300,000
Florida	May 2, 1879	Jefferson County, Fla	Ocilla River	Gulf of Mexico	Avoca, N. C	C. W. Schuermann	60,000
	May 2, 1879	Midway, Fla	Ockelockonee River	Gulf of Mexico	Avoca, N. C	C. W. Schuermann	60,000
Georgia	July 22, 1875	Rome, Ga	Coosa River	Alabama River	South Hadley Falls, Mass	Clark and Quinn	60,000
	June 2, 1876	Atlanta, Ga	Chattahoochee River	Apalachicola River	Havre de Grace, Md	A. A. Anderson	122,500
	June 2, 1876	Macon, Ga	Ocmulgee River	Altamaha River	Havre de Grace, Md	T. H. Bean	79,800
	June 3, 1876	Milledgeville, Ga	Oconee River	Altamaha River	Havre de Grace, Md	L. Kumlien	40,900
	May 22, 1877	Macon, Ga	Ocmulgee River	Altamaha River	Spesutie Narrows, Md	H. E. Quinn	100,000
	May 31, 1877	Milledgeville, Ga	Oconee River	Altamaha River	Spesutie Narrows, Md	C. D. Griswold	100,000
	June 9, 1877	Covington, Ga	Ocmulgee River	Altamaha River	Spesutie Narrows, Md	C. D. Griswold	100,000
	July 13, 1877	Columbus and West Point, Ga.	Chattahoochee River	Apalachicola River	South Hadley Falls, Mass	C. D. Griswold	100,000
	July 13, 1877	West Point, Ga	Chattahoochee River	Apalachicola River	South Hadley Falls, Mass	C. D. Griswold	10,000
	Apr. 25, 1878	Macon, Ga	Ocmulgee River	Altamaha River	Avoca, N. C	H. E. Quinn	60,000
	Apr. 25, 1878	Albany, Ga	Flint River	Apalachicola River	Avoca, N. C	H. E. Quinn	60,000
	May 25, 1878	Montezuma, Ga	Flint River	Apalachicola River	Havre de Grace, Md	J. F. Ellis	150,000
	June 9, 1878	Cartersville, Ga	Etowah River	Coosa River	Havre de Grace, Md	J. M. Donaldson	50,000
	Apr. 28, 1879	Columbus, Ga	Chattahoochee River	Apalachicola River	Avoca, N. C	L. Kumlein	75,000
	May 2, 1879	Stockton, Ga	Allapaha River	Suwanee River	Avoca, N. C	C. W. Schuermann	40,000
	May 2, 1879	Ousley, Ga	Little River	Suwanee River	Avoca, N. C	C. W. Schuermann	40,000
	May 3, 1879	Macon, Ga	Ocmulgee River	Altamaha River	Avoca, N. C	J. F. Ellis	100,000
	May 7, 1879	Covington, Ga	Ulcofauhatchee River	Ocmulgee River	Avoca, N. C	C. W. Schuermann	60,000
	May 7, 1879	Conyers, Ga	Yellow River	Ocmulgee River	Avoca, N. C	C. W. Schuermann	60,000
	May 29, 1879	Habersham County, Ga	Tugaloo River	Savannah River	Spesutie Narrows, Md	H. E. Quinn	50,000
	May 29, 1879	Gainesville, Ga	Chattahoochee River	Apalachicola River	Spesutie Narrows, Md	H. E. Quinn	37,500
	May 29, 1879	Resaca, Ga	Coosa River	Alabama River	Spesutie Narrows, Md	H. E. Quinn	100,000
	May 25, 1880	Greene County, Ga	Oconee River	Altamaha River	Potomac Station	J. F. Ellis	296,000
	May 25, 1880	Covington, Ga	Yellow River	Ocmulgee River	Potomac Station	J. F. Ellis	296,000
	May 25, 1880	Boltonville, Ga	Chattahoochee River	Apalachicola River	Potomac Station	J. F. Ellis	296,000
	June 13, 1880	Milledgeville, Ga	Oconee River	Altamaha River	Potomac Station	C. W. Schuermann	150,000
	June 13, 1880	Albany, Ga	Flint River	Apalachicola River	Potomac Station	C. W. Schuermann	150,000
Illinois	June 16, 1873	South Chicago, Ill	Calumet River	Lake Michigan	Coeymans, N. Y	J. Mason	70,000
	July 9, 1874	Rockford, Ill	Rock River	Mississippi River	Coeymans, N. Y	Welsher and Chase	70,000
	July 31, 1875	Rockford, Ill	Rock River	Mississippi River	South Hadley Falls, Mass	Chase and Ingalls	60,000
	May 27, 1878	Farlow, Ill	Kaskaskia River	Mississippi River	Havre de Grace, Md	C. W. Schuermann	100,000
	June 2, 1878	Rockford, Ill	Rock River	Mississippi River	Havre de Grace, Md	C. W. Schuermann	100,000
	June 9, 1878	Charleston, Ill	Embarras River	Wabash River	Havre de Grace, Md	W. H. Hines	50,000
	June 9, 1878	Marion, Ill	Mississinewa River	Wabash River	Havre de Grace, Md	W. H. Hines	50,000
Indiana	July 4, 1872	Indianapolis, Ind	White River	Ohio River	South Hadley Falls, Mass	Rev. Wm. Clift	400,000
	June 30, 1873	Logansport, Ind	Wabash River	Ohio River	Coeymans, N. Y	J. W. Milner and J. Mason.	40,000
	June 30, 1874	Logansport, Ind	Wabash River	Ohio River	Coeymans, N. Y	Mather and Veeley	75,000
	July 22, 1874	Indianapolis, Ind	White River	Ohio River	South Hadley Falls, Mass	Mason and Clark	80,000
	July 30, 1874	Elkhart, Ind	Saint Joseph River	Lake Michigan	South Hadley Falls, Mass	F. N. Clark	80,000
	July 31, 1874	Columbus, Ind	White River	Ohio River	South Hadley Falls, Mass	H. J. Brooks	80,000

D.—TABLE I.—*Distribution of shad from* 1872 *to* 1880, *inclusive*—Continued

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where fish were hatched.	By whom transferred.	Estimated number of fish.
Indiana—Cont'd	June 13, 1875	Indianapolis, Ind	White River	Ohio River	Coeymans, N. Y	F. N. Clark	100,000
	June 1, 1878	Elkhart, Ind	Elkhart River	Lake Michigan	Havre de Grace, Md	J. F. Ellis	100,000
	June 9, 1878	Terre Haute, Ind	Wabash River	Ohio River	Havre de Grace, Md	H. E. Quinn	65,000
	June 7, 1879	Terre Haute, Ind	Wabash River	Ohio River	Spesutie Narrows, Md	H. E. Quinn	100,000
	June 12, 1879	Indianapolis, Ind	White River	Wabash River	Spesutie Narrows, Md	Newton Simmons	50,000
	June 20, 1880	Lafayette, Ind	Wabash River	Ohio River	Potomac Station	H. E. Quinn	200,000
Iowa	July 30, 1874	Ottumwa, Iowa	Des Moines River	Mississippi River	South Hadley Falls, Mass	Mather and Vealey	60,000
	July 30, 1874	Des Moines, Iowa	Des Moines River	Mississippi River	South Hadley Falls, Mass	Mather and Vealey	40,000
	June 27, 1875	Des Moines, Iowa	Des Moines River	Mississippi River	Coeymans, N. Y	Clark and Quinn	90,000
	July 16, 1876	Des Moines, Iowa	Des Moines River	Mississippi River	South Hadley Falls, Mass	Quinn, Cory, and Shaw	148,500
	June 12, 1878	Cedar Rapids, Iowa	Cedar River	Mississippi River	Havre de Grace, Md	B. F. Shaw	40,000
	June 12, 1878	Logan, Iowa	Boyer River	Mississippi River	Havre de Grace, Md	B. F. Shaw	20,000
	June 12, 1878	Moingona, Iowa	Des Moines River	Mississippi River	Havre de Grace, Md	B. F. Shaw	40,000
Kansas	June 1, 1877	Topeka, Kans	Big Blue River	Kansas River	Spesutie Narrows, Md	H. E. Quinn	100,000
	June 1, 1879	La Cygne, Kans	Marais des Cygnes River	Osage River	Spesutie Narrows, Md	J. F. Ellis	20,000
	June 1, 1879	Manhattan, Kans	Blue River	Kansas River	Spesutie Narrows, Md	J. F. Ellis	15,000
	June 1, 1879	Davis County, Kans	Republican River	Kansas River	Spesutie Narrows, Md	J. F. Ellis	15,000
	June 1, 1879	Saline County, Kans	Solomon River	Kansas River	Spesutie Narrows, Md	J. F. Ellis	15,000
	June 1, 1879	Ellsworth, Kans	Smoky Hill River	Kansas River	Spesutie Narrows, Md	J. F. Ellis	15,000
	June 1, 1879	Reading, Kans	Marais des Cygnes River	Osage River	Spesutie Narrows, Md	J. F. Ellis	5,000
	June 1, 1879	Emporia, Kans	Neosho River	Arkansas River	Spesutie Narrows, Md	J. F. Ellis	10,000
	June 1, 1879	Cottonwood Falls, Kans	Cottonwood River	Neosho River	Spesutie Narrows, Md	J. F. Ellis	2,000
	June 1, 1879	Florence, Kans	Cottonwood River	Neosho River	Spesutie Narrows, Md	J. F. Ellis	3,000
	June 1, 1879	Florence, Kans	Doyle Creek	Neosho River	Spesutie Narrows, Md	J. F. Ellis	3,000
	June 1, 1879	Halstead, Kans	Little River	Arkansas River	Spesutie Narrows, Md	J. F. Ellis	5,000
	June 1, 1879	Hutchinson, Kans	Cow River	Arkansas River	Spesutie Narrows, Md	J. F. Ellis	5,000
	June 1, 1879	El Dorado, Kans	Walnut River	Arkansas River	Spesutie Narrows, Md	J. F. Ellis	10,000
	June 1, 1879	Great Bend, Kans	Walnut River	Arkansas River	Spesutie Narrows, Md	J. F. Ellis	10,000
	June 1, 1879	Larned, Kans	Pawnee River	Arkansas River	Spesutie Narrows, Md	J. F. Ellis	27,000
Kentucky	June 1, 1877	Mount Sterling, Ky	Licking River	Ohio River	Spesutie Narrows, Md	F. A. Ingalls	50,000
	July 18, 1877	Muntordsville, Ky	Green River	Ohio River	South Hadley Falls, Mass	F. N. Clark	110,000
	May 26, 1878	Somerset, Ky	Cumberland River	Ohio River	Havre de Grace, Md	H. E Quinn	60,000
	May 26, 1878	McKinney's Station, Ky	Green River	Ohio River	Havre de Grace, Md	H. E. Quinn	60,000
	June 3, 1878	Bowling Green, Ky	Big Barren River	Green River	Havre de Grace, Md	William Russ	100,000
	June 4, 1878	Mercer County, Ky	Kentucky River	Ohio River	Havre de Grace, Md	F. A. Ingalls	130,000
	June 4, 1878	Scott County, Ky	Elkhorn Creek	Kentucky River	Havre de Grace, Md	F. A. Ingalls	45,000
	May 28, 1879	Shepherdsville, Ky	Salt River	Ohio River	Spesutie Narrows, Md	J. F. Ellis	200,000
	June 1, 1879	Shepherdsville, Ky	Salt River	Ohio River	Spesutie Narrows, Md	N. Simmons	150,000
	June 7, 1880	Sheph rdsville, Ky	Salt River	Ohio River	Potomac Station	Hon. William Griffith	700,000
Louisiana	July 29, 1875	Tickfaw, La	Notalbany River	Lake Pontchartrain	South Hadley Falls, Mass	Mather and Bell	60,000
	May 27, 1878	Tickfaw, La	Amite River	Lake Pontchartrain	Havre de Grace, Md	W. M. Russ	100,000
	May 8, 1879	Railroad, Madison County, La.	Roundaway Creek	Mississippi River	Avoca, N. C	H. E. Quinn	50,000

	May 8, 1879	Railroad, Madison County, La.	Tensas River	Mississippi River	Avoca, N. C.	H. E. Quinn	35,000
	May 8, 1879	Railroad, Richland County, La.	Bayou Macon	Tensas River	Avoca, N. C	H. E. Quinn	30,000
	May 8, 1879	Railroad, Richland County, La.	Bœuf River	Washita River	Avoca, N. C	H. E. Quinn	35,000
	May 8, 1879	Railroad, Richland County, La.	Clear Lake	Black River	Avoca, N. C	H. E. Quinn	35,000
	May 8, 1879	Monroe, La	Washita River	Red River	Avoca, N. C	H. E. Quinn	35,000
Maine	July 12, 1873	Mattawamkeag, Me	Mattawamkeag River	Penobscot River	South Hadley Falls, Mass	J. W. Milner & J. Mason	100,000
	July 25, 1874	Waterville, Me	Kennebec River	Atlantic Ocean	South Hadley Falls, Mass	Mason and Clark	100,000
	July 28, 1874	Mattawamkeag, Me	Mattawamkeag River	Penobscot River	South Hadley Falls, Mass	Welsher and Griswold	100,000
	Aug. 14, 1874	Mattawamkeag, Me	Mattawamkeag River	Penobscot River	South Hadley Falls, Mass	H. J. Brooks	100,000
	July 12, 1875	Mattawamkeag, Me	Mattawamkeag River	Penobscot River	South Hadley Falls, Mass	Quinn and Griswold	100,000
	Aug. 7, 1877		Penobscot River	Penobscot Bay	South Hadley Falls, Mass	H. J. Rice	85,000
	June 15, 1880	Waterville, Me	Kennebec River	Atlantic Ocean	Havre de Grace, Md	H. E. Quinn	337,500
	June 15, 1880	Mattawamkeag, Me	Penobscot River	Penobscot Bay	Havre de Grace, Md	H. E. Quinn	337,500
Maryland	May 31, 1875	Moxley Point, Md	Potomac River	Chesapeake Bay	Moxley Point, Md	Not transferred	185,000
	June 1, 1875	Moxley Point, Md	Potomac River	Chesapeake Bay	Moxley Point, Md	Not transferred	282,500
	June 3, 1875	Moxley Point, Md	Potomac River	Chesapeake Bay	Moxley Point, Md	Not transferred	220,000
	June 4, 1875	Moxley Point, Md	Potomac River	Chesapeake Bay	Moxley Point, Md	Not transferred	210,000
	June 5, 1875	Moxley Point, Md	Potomac River	Chesapeake Bay	Moxley Point, Md	Not transferred	105,000
	June 6, 1875	Moxley Point, Md	Potomac River	Chesapeake Bay	Moxley Point, Md	Not transferred	70,000
	June 7, 1875	Moxley Point, Md	Potomac River	Chesapeake Bay	Moxley Point, Md	Not transferred	110,000
	May 10, 1876	Bristol Landing, Md	Patuxent River	Chesapeake Bay	Bristol Landing, Md	Not transferred	50,000
	May 11, 1876	Bristol Landing, Md	Patuxent River	Chesapeake Bay	Bristol Landing, Md	Not transferred	75,000
	May 12, 1876	Bristol Landing, Md	Patuxent River	Chesapeake Bay	Bristol Landing, Md	Not transferred	50,000
	May 18, 1876	Carpenter's Point, Md	North East River	Chesapeake Bay	Carpenter's Point, Md	Not transferred	108,000
	May 19, 1876	Carpenter's Point, Md	North East River	Chesapeake Bay	Carpenter's Point, Md	Not transferred	108,000
	May 22, 1876	Carpenter's Point, Md	North East River	Chesapeake Bay	Carpenter's Point, Md	Not transferred	162,000
	May 23, 1876	Carpenter's Point, Md	North East River	Chesapeake Bay	Carpenter's Point, Md	Not transferred	168,000
	May 24, 1876	Carpenter's Point, Md	North East River	Chesapeake Bay	Carpenter's Point, Md	Not transferred	46,000
	May 26–7, 76	Carpenter's Point, Md	North East River	Chesapeake Bay	Carpenter's Point, Md	Not transferred	110,000
	May 29, 1876	Carpenter's Point, Md	North East River	Chesapeake Bay	Carpenter's Point, Md	Not transferred	105,500
	May 31, 1876	Carpenter's Point, Md	North East River	Chesapeake Bay	Carpenter's Point, Md	Not transferred	15,000
	May 31, 1876	Swan Creek, Md	Susquehanna River	Chesapeake Bay	Swan Creek, Md	Not transferred	30,000
	June 2, 1876	Swan Creek, Md	Susquehanna River	Chesapeake Bay	Swan Creek, Md	Not transferred	50,000
	June 6, 1876	Swan Creek, Md	Susquehanna River	Chesapeake Bay	Swan Creek, Md	Not transferred	80,000
	June 7, 1876	Swan Creek, Md	Susquehanna River	Chesapeake Bay	Swan Creek, Md	Not transferred	70,000
	June 7, 1876	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Fishing Battery Station	Not transferred	90,000
	June 9, 1876	Cumberland, Md	Potomac River	Chesapeake Bay	Havre de Grace, Md	Anderson and Kunkien	178,000
	June 10, 1876	Swan Creek, Md	Susquehanna River	Chesapeake Bay	Swan Creek, Md	Not transferred	50,000
	June 10, 1876	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Fishing Battery Station	Not transferred	190,000
	June 1–14, 76	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Havre de Grace Station, No. 1.	Not transferred	272,000
	June 16, 1876	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Havre de Grace Station, No. 2.	Not transferred	70,000
	June 17, 1876	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Havre de Grace Station, No. 2.	Not transferred	30,000
	June 18, 1876	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Havre de Grace Station, No. 2.	Not transferred	25,000
	June 20, 1876	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Fishing Battery Station	Not transferred	70,000

D.—TABLE I.—*Distribution of shad from* 1872 *to* 1880, *inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where fish were hatched.	By whom transferred.	Estimated number of fish.
Maryland—Continued.	June 21, 1876	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Fishing Battery Station	Not transferred	100,000
	May 17, 1877	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	200,000
	May 18, 1877	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	785,000
	May 19, 1877	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	350,000
	May 20, 1877	Havre de Grace, Md	North East River	Chesapeake Bay	Havre de Grace, Md	Not transferred	3,055,500
	May 21, 1877	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	50,000
	May 22, 1877	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	10,000
	May 24, 1877	Havre de Grace, Md	North East River	Chesapeake Bay	Havre de Grace, Md	Not transferred	153,000
	May 25, 1877	Havre de Grace, Md	North East River	Chesapeake Bay	Havre de Grace, Md	Not transferred	85,000
	May 26, 1877	Havre de Grace, Md	North East River	Chesapeake Bay	Havre de Grace, Md	Not transferred	50,000
	May 27, 1877	Havre de Grace, Md	North East River	Chesapeake Bay	Havre de Grace, Md	Not transferred	50,000
	May 28, 1877	Havre de Grace, Md	North East River	Chesapeake Bay	Havre de Grace, Md	Not transferred	60,000
	May 30, 1877	Havre de Grace, Md	Spesutie Narrows	Susquehanna River	Spesutie Narrows, Md	Not transferred	46,000
	May 31, 1877	Havre de Grace, Md	Spesutie Narrows	Susquehanna River	Spesutie Narrows, Md	Not transferred	100,000
	June 1, 1877	Havre de Grace, Md	Spesutie Narrows	Susquehanna River	Spesutie Narrows, Md	Not transferred	56,000
	June 1, 1877		Elk River	Chesapeake Bay	Spesutie Narrows, Md	J. W. Milner	150,000
	June 1, 1877	Cumberland, Md	Potomac River	Chesapeake Bay	Spesutie Narrows, Md	L. Fairfax	100,000
	June 1, 1877		Bohemia River	Chesapeake Bay	Spesutie Narrows, Md	J. W. Milner	126,000
	June 1, 1877		Sassafras River	Chesapeake Bay	Spesutie Narrows, Md	J. W. Milner	285,000
	June 1, 1877	Cumberland, Md	Potomac River	Chesapeake Bay	Spesutie Narrows, Md	L. Fairfax	150,000
	June 2, 1877	Havre de Grace, Md	Spesutie Narrows	Susquehanna River	Spesutie Narrows, Md	Not transferred	127,000
	June 3, 1877	Havre de Grace, Md	Spesutie Narrows	Susquehanna River	Spesutie Narrows, Md	Not transferred	12,800
	June 5, 1877	Havre de Grace, Md	Spesutie Narrows	Susquehanna River	Spesutie Narrows, Md	Not transferred	100,000
	June 5, 1877	Denton, Md	Choptank River	Chesapeake Bay	Spesutie Narrows, Md	J. W. Milner	510,000
	June 6, 1877	Havre de Grace, Md	Spesutie Narrows	Susquehanna River	Spesutie Narrows, Md	Not transferred	72,000
	June 7, 1877	Havre de Grace, Md	Spesutie Narrows	Susquehanna River	Spesutie Narrows, Md	Not transferred	30,000
	June 7, 1877	Laurel, Md	Patuxent River	Chesapeake Bay	Spesutie Narrows, Md	C. D. Griswold	160,000
	June 8, 1877	Havre de Grace, Md	Spesutie Narrows	Susquehanna River	Spesutie Narrows, Md	Not transferred	50,000
	June 9, 1877	Havre de Grace, Md	Spesutie Narrows	Susquehanna River	Spesutie Narrows, Md	Not transferred	20,000
	June 10, 1877	Havre de Grace, Md	Spesutie Narrows	Susquehanna River	Spesutie Narrows, Md	Not transferred	60,000
	June 11, 1877	Havre de Grace, Md	Spesutie Narrows	Susquehanna River	Spesutie Narrows, Md	Not transferred	20,000
	June 12, 1877	Salisbury, Md	Wicomico River	Chesapeake Bay	Spesutie Narrows, Md	J. W. Milner	100,000
	June 12, 1877	Pocomoke City, Md	Pocomoke River	Chesapeake Bay	Spesutie Narrows, Md	J. W. Milner	100,000
	June 12, 1877	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	10,000
	June 13, 1877	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	36,000
	June 13, 1877	Cockeysville, Md	Gunpowder River	Chesapeake Bay	Spesutie Narrows, Md	L. Fairfax	50,000
	Apr. 21, 1878	Various points	Potomac River	Chesapeake Bay	Avoca, N. C	William Hamlen	100,000
	May 1, 1878	Point of Rocks, Md	Potomac River	Chesapeake Bay	Avoca, N. C	William Hamlen	100,000
	May 17, 1878	Greensborough, Md	Choptank River	Chesapeake Bay	Havre de Grace, Md	Thomas Hughlett	100,000
	May 23, 1878	Nesbsco Mills, Md	Nesbsco River	Potomac River	Steamer Lookout	Not transferred	50,000
	May 24, 1878	Federalsburg, Md	Nanticoke River	Chesapeake Bay	Havre de Grace, Md	Thomas Hughlett	100,000
	May 24, 1878	Glymont, Md	Potomac River	Chesapeake Bay	Steamer Lookout	Not transferred	75,000
	May 25, 1878	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	150,000
	May 26, 1878	Cecil County, Md	North East River	Chesapeake Bay	Havre de Grace, Md	Not transferred	350,000

May 26, 1878	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	100,000
May 27, 1878	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Havre de Grace, Md	Not transferred	200,000
May 28, 1878	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Havre de Grace, Md	Not transferred	400,000
May 28, 1878	Fort Washington, Md	Potomac River	Chesapeake Bay	Steamer Lookout	Not transferred	100,000
May 28, 1878	Glymont, Md	Potomac River	Chesapeake Bay	Steamer Lookout	Not transferred	300,000
May 29, 1878	Salisbury, Md	Wicomico River	Chesapeake Bay	Havre de Grace, Md	Thomas Hughlett	175,000
May 29, 1878	Princess Anne, Md	Manokin River	Tangier Sound	Havre de Grace, Md	Thomas Hughlett	75,000
May 29, 1878	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Havre de Grace, Md	Not transferred	1,500,000
May 30, 1878	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Havre de Grace, Md	Not transferred	500,000
May 31, 1878	Millington, Md	Chester River	Chesapeake Bay	Havre de Grace, Md	Thomas Hughlett	250,000
June 1, 1878	Easton, Md	Tread Haven	Choptank River	Havre de Grace, Md	S. M. Rixey	50,000
June 1, 1878	Easton, Md	Miles River	Eastern Bay	Havre de Grace, Md	S. M. Rixey	75,000
June 1, 1878	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Havre de Grace, Md	Not transferred	500,000
June 3, 1878	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Havre de Grace, Md	Not transferred	500,000
June 3, 1878	Greensborough, Md	Choptank River	Chesapeake Bay	Havre de Grace, Md	S. M. Rixey	100,000
June 3, 1878	Hillsborough, Md	Tuckahoe River	Choptank River	Havre de Grace, Md	S. M. Rixey	50,000
June 5, 1878	Laurel, Md	Patuxent River	Chesapeake Bay	Havre de Grace, Md	J. M. Donaldson	150,000
June 6, 1878	Laurel, Md	Patuxent River	Chesapeake Bay	Havre de Grace, Md	David Scott	150,000
June 6, 1878	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Havre de Grace, Md	Not transferred	500,000
June 10, 1878	Snow Hill, Md	Pocomoke River	Chesapeake Bay	Havre de Grace, Md	S. M. Rixey	150,000
June 10, 1878	Perryman, Md	Bush River	Chesapeake Bay	Havre de Grace, Md	W. F. Page	150,000
June 10, 1878	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Havre de Grace, Md	Not transferred	140,000
June 11, 1878	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Havre de Grace, Md	Not transferred	185,000
June 14, 1878	Cockeysville, Md	Gunpowder River	Chesapeake Bay	Havre de Grace, Md	N. Simmons	80,000
June 14, 1878	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Havre de Grace, Md	Not transferred	120,000
May 16, 1879	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	300,000
May 17, 1879	Cordova Station, Md	Miles Creek	Chesapeake Bay	Spesutie Narrows, Md	T. Hughlett, jr	60,000
May 17, 1879	Cordova Station, Md	Wye Mills Creek	Miles Creek	Spesutie Narrows, Md	T. Hughlett, jr	80,000
May 18, 1879	Salisbury, Md	Wicomico River	Chesapeake Bay	Spesutie Narrows, Md	L. Campbell	150,000
May 19, 1879	Savage, Md	Patuxent River	Chesapeake Bay	Spesutie Narrows, Md	J. F. Ellis	115,000
May 19, 1879	Laurel, Md	Patuxent River	Chesapeake Bay	Spesutie Narrows, Md	J. F. Ellis	110,000
May 19, 1879	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	100,000
May 21, 1879	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	25,000
May 21, 1879	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	100,000
May 24, 1879	Federalsburg, Md	Nanticoke River	Chesapeake Bay	Spesutie Narrows, Md	T. Hughlett, jr	80,000
May 24, 1879	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	150,000
May 26, 1879	Whaleysville, Md	Pocomoke River	Chesapeake Bay	Spesutie Narrows, Md	L. Campbell	100,000
May 26, 1879	Berlin, Md	Saint Michael's River	Chesapeake Bay	Spesutie Narrows, Md	L. Campbell	50,000
May 26, 1879	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	150,000
May 27, 1879	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	100,000
May 28, 1879	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	125,000
May 29, 1879	Henderson, Md	Choptank River	Chesapeake Bay	Spesutie Narrows, Md	T. Hughlett, jr	100,000
May 29, 1879	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	50,000
May 30, 1879	Millington, Md	Chester River	Chesapeake Bay	Spesutie Narrows, Md	L. Campbell	140,000
May 30, 1879	Centreville, Md	Corsica River	Chester River	Spesutie Narrows, Md	L. Campbell	60,000
May 30, 1879	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	200,000
May 30, 1879	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	150,000
May 31, 1879	Middletown, Md	Sassafras River	Chesapeake Bay	Spesutie Narrows, Md	T. Hughlett, jr	100,000
May 31, 1879	Middletown, Md	Bohemia River	Chesapeake Bay	Spesutie Narrows, Md	T. Hughlett, jr	100,000
May 31, 1879	Battery Light, Md	Susquehanna River	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	400,000
June —, 1879	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	40,000
June 1, 1879	Elkton, Md	Elk River	Chesapeake Bay	Spesutie Narrows, Md	T. Hughlett, jr	200,000

D.—TABLE I.—*Distribution of shad from* 1872 *to* 1880, *inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where fish were hatched.	By whom transferred	Estimated number of fish.
Maryland—Continued.	June 1, 1879	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	300,000
	June 1, 1879	Battery Light	Susquehanna River	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	400,000
	June 2, 1879	Port Deposit, Md	Susquehanna River	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	300,000
	June 2, 1879	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	200,000
	June 2, 1879	Old Bay Fishing	Susquehanna River	Chesapeake Bay	Old Bay Fishery, Md	Not transferred	120,000
	June 3, 1879	Princess Anne, Md	Manokin River	Chesapeake Bay	Spesutie Narrows, Md	T. Hughlett, jr	150,000
	June 3, 1879	Newtown, Md	Pocomoke River	Chesapeake Bay	Spesutie Narrows, Md	T. Hughlett, jr	125,000
	June 3, 1879	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	150,000
	June 4, 1879	Cockeysville, Md	Gunpowder River	Chesapeake Bay	Spesutie Narrows, Md	T. Hughlett, jr	175,000
	June 4, 1879	Battery Light	Susquehanna River	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	150,000
	June 6, 1879	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	100,000
	June 7, 1879	Old Bay Fishery	Susquehanna River	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	85,000
	June 8, 1879	Relay Station, Md	Patapsco River	Chesapeake Bay	Spesutie Narrows, Md	W. Hamlen	175,000
	June 8, 1879	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	100,000
	June 9, 1879	Old Bay Fishery	Susquehanna River	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	137,000
	June 10, 1879	Point of Rocks, Md	Potomac River	Chesapeake Bay	Spesutie Narrows, Md	J. F. Ellis	200,000
	June 10, 1879	Patuxent, Md	Patuxent River	Chesapeake Bay	Spesutie Narrows, Md	W. M. Russ	125,000
	June 10, 1879	Federalsburg, Md	Nanticoke River	Chesapeake Bay	Spesutie Narrows, Md	T. Hughlett, jr	50,000
	June 10, 1879	Airey's Station, Md	Transquaking River	Chesapeake Bay	Spesutie Narrows, Md	T. Hughlett, jr	25,000
	June 10, 1879	Cambridge, Md	Blackwater River	Chesapeake Bay	Spesutie Narrows, Md	T. Hughlett, jr	25,000
	June 10, 1879	Hillsborough, Md	Tuckahoe River	Chesapeake Bay	Spesutie Narrows, Md	T. Hughlett, jr	50,000
	June 10, 1879	Henderson, Md	Choptank River	Chesapeake Bay	Spesutie Narrows, Md	T. Hughlett, jr	50,000
	June 11, 1879	Battery Light	Susquehanna River	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	150,000
	June 11, 1879	Baltimore County, Md	Gunpowder River	Chesapeake Bay	Spesutie Narrows, Md	N. Simmons	105,000
	June 14, 1879	Port Deposit, Md	Susquehanna River	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	75,000
	June 14, 1879	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Spesutie Narrows, Md	Not transferred	200,000
	May 7, 1880	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	10,000
	May 8, 1880	Laurel, Md	Patuxent River	Chesapeake Bay	Potomac Station	C. W. Schuermann	300,000
	May 10, 1880	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Havre de Grace, Md	Not transferred	413,000
	May 11, 1880	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Havre de Grace, Md	Not transferred	250,000
	May 11, 1880	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	150,000
	May 11, 1880	Savage, Md	Patuxent River	Chesapeake Bay	Potomac Station	W. H. Jenkins, jr	200,000
	May 12, 1880	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	145,000
	May 12, 1880	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Havre de Grace, Md	Not transferred	100,000
	May 13, 1880	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Havre de Grace, Md	Not transferred	190,000
	May 13, 1880	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Havre de Grace, Md	Not transferred	350,000
	May 14, 1880	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Havre de Grace, Md	Not transferred	270,000
	May 15, 1880	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Havre de Grace, Md	Not transferred	215,000
	May 15, 1880	Cumberland, Md	Spesutie Narrows	Chesapeake Bay	Potomac Station	H. E. Quinn	300,000
	May 16, 1880	Savage, Md	Patuxent River	Chesapeake Bay	Potomac Station	N. Simmons	300,000
	May 17, 1880	Point of Rocks, Md	Potomac River	Chesapeake Bay	Potomac Station	J. F. Ellis	300,000
	May 18, 1880	Havre de Grace, Md	Spesutie River	Chesapeake Bay	Havre de Grace, Md	Not transferred	225,000
	May 19, 1880	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	250,000
	May 20, 1880	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	285,000

	May 20, 1880	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	200,000
	May 20, 1880	Swan Creek, Md	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	200,000
	May 21, 1880	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	350,000
	May 21, 1880	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	50,000
	May 21, 1880	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Havre de Grace, Md	Not transferred	25,000
	May 21, 1880	Savage, Md	Patuxent River	Chesapeake Bay	Potomac Station	J. F. Ellis	600,000
	May 22, 1880	Havre de Grace, Md	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	460,000
	May 22, 1880	Fort Washington, Md	Potomac River	Chesapeake Bay	Potomac Station	Not transferred	200,000
	May 23, 1880	Fort Washington, Md	Potomac River	Chesapeake Bay	Potomac Station	Not transferred	25,000
	May 24, 1880	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Havre de Grace, Md	Not transferred	240,000
	May 25, 1880	Moxley Point	Potomac River	Chesapeake Bay	Potomac Station	Not transferred	500,000
	May 25, 1880	Savage, Md	Patuxent River	Chesapeake Bay	Potomac Station	C. W. Schuermann	500,000
	May 26, 1880	Moxley Point	Potomac River	Chesapeake Bay	Potomac Station	Not transferred	500,000
	May 26, 1880	Laurel, Md	Patuxent River	Chesapeake Bay	Potomac Station	C. J. Huske	1,500,000
	May 27, 1880	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Havre de Grace, Md	Not transferred	1,070,000
	May 28, 1880	Havre de Grace, Md	Spesutie Narrows	Chesapeake Bay	Havre de Grace, Md	Not transferred	75,000
	May 29, 1880	Perrymansville, Md	Bush River	Chesapeake Bay	Havre de Grace, Md	N. Simmons	150,000
	May 29, 1880	Deer Park, Md	Little Youghiogheny River	Youghiogheny River	Potomac Station	S. M. Rixey	50,000
	June 2, 1880	Off Watson Island	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	50,000
	June 2, 1880	Moxley Point	Potomac River	Chesapeake Bay	Potomac Station	Not transferred	275,000
	June 3, 1880	Perrymansville, Md	Bush River	Chesapeake Bay	Havre de Grace, Md	M. Gleason	285,000
	June 4, 1880	Off Watson Island	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	485,000
	June 6, 1880	Off Watson Island	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	460,000
	June 7, 1880	Off Watson Island	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	55,000
	June 7, 1880	Savage, Md	Patuxent River	Chesapeake Bay	Potomac Station	S. M. Rixey	375,000
	June 8, 1880	Off Watson Island	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	650,000
	June 9, 1880	Off Watson Island	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	140,000
	June 9, 1880	Fort Washington, Md	Potomac River	Chesapeake Bay	Potomac Station	Not transferred	100,000
	June 12, 1880	Off Watson Island	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	400,000
	June 12, 1880	Off Watson Island	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	Not transferred	100,000
Massachusetts	Aug. 8, 1874	Smith's Ferry, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass	H. J. Brooks	60,000
	Aug. 10, 1874	Westfield, Mass	Westfield River	Connecticut River	South Hadley Falls, Mass	C. D. Griswold	80,000
	Aug. 13, 1874	Westfield, Mass	Westfield River	Connecticut River	South Hadley Falls, Mass	F. A. Smith	210,000
	July 8, 1875	Smith's Ferry, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass	Mason and Quinn	250,000
	July 13, 1875	Smith's Ferry, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass	Mason and Quinn	250,000
	July 16, 1875	Smith's Ferry, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass	Mason and Quinn	225,000
	July 7–31, '75	South Hadley Falls, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass	Charles C. Smith	4,500,000
	July 12, 1876	Bridgewater, Mass	Taunton River	Narragansett Bay	South Hadley Falls, Mass	R. R. Holmes	80,000
	July 14, 1876	Westfield, Mass	Westfield River	Connecticut River	South Hadley Falls, Mass	R. R. Holmes	80,000
	July 15, 1876	Middleborough, Mass	Taunton River	Narragansett Bay	South Hadley Falls, Mass	R. R. Holmes	100,000
	July 26, 1876	South Hadley Falls, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass	Not transferred	150,000
	July 29, 1876	South Hadley Falls, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass	Not transferred	4,000
	Aug. 1, 1876	South Hadley Falls, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass	Not transferred	5,000
	Aug. 2, 1876	South Hadley Falls, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass	Not transferred	40,000
	July 4, 1877	Smith's Ferry, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass	C. G. Atkins	12,000
	July 10, 1877	Smith's Ferry, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass	C. G. Atkins	145,000
	July 17, 1877	Smith's Ferry, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass	C. G. Atkins	207,000
	July 20, 1877	South Hadley Falls, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass		60,000
	July 23, 1877	Smith's Ferry, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass	Clark & Atkins	165,000
	July 23, 1877	Smith's Ferry, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass	C. G. Atkins	50,000
	July 28, 1877	Middleborough, Mass	Taunton River	Narragansett Bay	South Hadley Falls, Mass	R. R. Holmes	50,000

D.—TABLE I.—*Distribution of shad from* 1872 *to* 1880, *inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where fish were hatched.	By whom transferred.	Estimated number of fish.
Massachusetts—Continued.	July 30, 1877	Smith's Ferry, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass	William Smith	100,000
	July 31, 1877	Smith's Ferry, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass	C. G. Atkins	80,000
	July 31, 1877	Bridgewater, Mass	Taunton River	Narragansett Bay	South Hadley Falls, Mass	R. R. Holmes	50,000
	Aug. 1, 1877	Smith's Ferry, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass	C. G. Atkins	33,000
	Aug. 3, 1877	Smith's Ferry, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass	C. G. Atkins	27,000
	Aug. 4, 1877	Smith's Ferry, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass	William Smith	14,000
	Aug. 7, 1877	Smith's Ferry, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass	William Smith	22,000
	Aug. 8, 1877	Smith's Ferry, Mass	Connecticut River	Long Island Sound	South Hadley Falls, Mass	William Smith	62,000
Michigan	June 17, 1873	Lansing, Mich	Grand River	Lake Michigan	South Hadley Falls, Mass	George H. Jerome	50,000
	June 24, 1873	Detroit, Mich	Detroit River	Lake Erie	South Hadley Falls, Mass	J. W. Milner and J. Mason	20,000
	June 24, 1873	Ionia, Mich	Grand River	Lake Michigan	South Hadley Falls, Mass	J. W. Milner and J. Mason	80,000
	June 28, 1873		Flint River	Saginaw River	South Hadley Falls, Mass	George H. Jerome	10,000
	June 28, 1873	Monroe, Mich	Raisin River	Lake Erie	South Hadley Falls, Mass	George H. Jerome	10,000
	June 28, 1873	Niles, Mich	Saint Joseph River	Lake Michigan	South Hadley Falls, Mass	George H. Jerome	30,000
	June 28, 1873	Kalamazoo County, Mich	Long Lake	Kalawazoo River	South Hadley Falls, Mass	George H. Jerome	10,000
	Aug. 1, 1874	Detroit, Mich	Detroit River	Lake Erie	South Hadley Falls, Mass	Chase & Griswold	80,000
	Aug. 6, 1874	Corunna, Mich	Shiawassee River	Lake Huron	South Hadley Falls, Mass	F. N. Clark	80,000
Minnesota	July 5, 1872	Saint Paul, Minn	Mississippi River	Gulf of Mexico	South Hadley Falls, Mass	Seth Green	25,000
	Aug. 5, 1874	Saint Paul, Minn	Mississippi River	Gulf of Mexico	South Hadley Falls, Mass	Chase and Vealey	100,000
	July 29, 1877	Saint Paul, Minn	Mississippi River	Gulf of Mexico	South Hadley Falls, Mass	H. E. Quinn	100,000
Mississippi	July 16, 1875	Jackson, Miss	Pearl River	Gulf of Mexico	Point Pleasant, Pa	Anderson and Schwartz	100,000
	June 13, 1876	Jackson, Miss	Pearl River	Lake Borgne	Havre de Grace, Md	A. A. Anderson	74,000
	June 13, 1876	Abbeville, Miss	Yazoo River	Mississippi River	Havre de Grace, Md	Anderson and Abbott	74,000
	June 4, 1877	Canton, Miss	Big Black River	Mississippi River	Spesutie Narrows, Md	F. A. Ingalls	100,000
	Apr. 13, 1878	Vaughan, Miss	Big Black River	Mississippi River	Avoca, N. C	C. W. Schuermann	144,000
	Apr. 23, 1878	Friar's Point, Miss	Sunflower River	Yazoo River	Avoca, N. C	J. F. Ellis	100,000
	Apr. 23, 1878	Holly Springs, Miss	Cold Water River	Yazoo River	Avoca, N. C	C. W. Schuermann	40,000
	Apr. 23, 1878	Lafayette County, Miss	Tallahatchie River	Yazoo River	Avoca, N. C	C. W. Schuermann	40,000
	Apr. 23, 1878	Grenada, Miss	Yalabusha River	Yazoo River	Avoca, N. C	C. W. Schuermann	40,000
	May 15, 1878	Fulton, Miss	Tombigbee River	Mobile Bay	Havre de Grace, Md	J. F. Ellis	90,000
	May 15, 1878	Aberdeen, Miss	Tombigbee River	Mobile Bay	Havre de Grace, Md	J. F. Ellis	60,000
	May 23, 1878	Meridian, Miss	Okatibee Creek	Chickasawha River	Havre de Grace, Md	R. E. Earle	100,000
	Apr. 26, 1879	Jackson, Miss	Pearl River	Gulf of Mexico	Avoca, N. C	J. F. Ellis	150,000
	May 13, 1879	Meridian, Miss	Chunky River	Chickasawha River	Avoca, N. C	C. W. Schuermann	25,000
	May 20, 1879	Ripley, Miss	Tippah River	Tallahatchie River	Spesutie Narrows, Md	J. F. Ellis	50,000
	May 20, 1879	La Fayette County, Miss	Tallahatchie River	Yazoo River	Spesutie Narrows, Md	J. F. Ellis	50,000
	May 20, 1879	La Fayette, Miss	Yocana River	Yazoo River	Spesutie Narrows, Md	J. F. Ellis	50,000
	May 20, 1879	Grenada, Miss	Yalabusha River	Yazoo River	Spesutie Narrows, Md	J. F. Ellis	50,000
Missouri	July 5, 1872	Washington, Mo	Missouri River	Mississippi River	South Hadley Falls, Mass	Rev. Wm. Clift	500
	July 5, 1872	Hermann, Mo	Missouri River	Mississippi River	South Hadley Falls, Mass	Rev. Wm. Clift	500
	June 8, 1876	Poplar Bluff, Mo	Black River	Mississippi River	Havre de Grace, Md	Ingalls and Fairfax	20,000
	June 9, 1876	Callao, Mo	Chariton River	Missouri River	Havre de Grace, Md	B. S. Cory, jr	61,000
	July 13, 1876	Pacific, Mo	Meramec River	Mississippi River	South Hadley Falls, Mass	Clark and Fairfax	99,500
	Aug. 9, 1876	Kansas City, Mo	Kansas River	Missouri River	South Hadley Falls, Mass	Anderson and Smith	119,500

	May 21, 1877	Saint Louis, Mo	Mississippi River	Gulf of Mexico	Spesutie Narrows, Md	L. Fairfax	100,000
	June 4, 1877	Saint Joseph, Mo	Missouri River	Mississippi River	Spesutie Narrows, Md	L. Fairfax	100,000
	July 4, 1877	Springfield, Mo	James River	White River	South Hadley Falls, Mass	F. A. Ingalls	90,000
	July 5, 1877	Mexico, Mo	Salt Creek	Mississippi River	South Hadley Falls, Mass	C. D. Griswold	110,000
	May 20, 1878	Neosho, Mo	Shoal Creek	Arkansas River	Havre de Grace, Md	C. W. Schuermann	120,000
	June 8, 1878	Saint Louis, Mo	Mississippi River	Gulf of Mexico	Havre de Grace, Md	F. A. Ingalls	100,000
	May 31, 1879	Franklin, Mo	Meramec River	Mississippi River	Spesutie Narrows, Md	L. Kumlien	50,000
	May 31, 1879	Piedmont, Mo	Big Black River	White River	Spesutie Narrows, Md	L. Kumlien	75,000
	May 31, 1879	Poplar Bluffs, Mo	Big Black River	White River	Spesutie Narrows, Md	L. Kumlien	75,000
	June 14, 1879	Webster County, Mo	James River	White River	Spesutie Narrows, Md	L. Kumlien	75,000
	June 14, 1879	Arcadia, Mo	San François River	Black River	Spesutie Narrows, Md	L. Kumlien	75,000
	June 4, 1880	Jerome, Mo	Gasconade River	Missouri River	Potomac Station	S. M. Rixey	40,000
	June 4, 1880	Henry County, Mo	Grand River	Missouri River	Potomac Station	J. F. Ellis	20,000
	June 4, 1880	Shelby County, Mo	Salt River	Mississippi River	Potomac Station	J. F. Ellis	20,000
	June 4, 1880	Schell City, Mo	Osage River	Missouri River	Potomac Station	G. G. Davenport	40,000
	June 4, 1880	Macon County, Mo	Chariton River	Missouri River	Potomac Station	J. F. Ellis	20,000
	June 5, 1880	Nodaway County, Mo	Platte River	Missouri River	Potomac Station	J. F. Ellis	20,000
	June 5, 1880	Nodaway County, Mo	One Hundred and Two River.	Platte River	Potomac Station	J. F. Ellis	20,000
	June 5, 1880	Nodaway, Mo	Nodaway River	Missouri River	Potomac Station	J. F. Ellis	20,000
New Hampshire	July 24, 1877	Tilton, N. H	Winnipesaukee River	Merrimac River	South Hadley Falls, Mass	Weber and Powers	75,000
	July 28, 1877	Contoocook, N. H	Contoocook River	Merrimac River	South Hadley Falls, Mass	Weber and Powers	50,000
New York	June 30, 1872	Salamanca, N. Y	Allegheny River	Ohio River	Coeymans, N. Y	Seth Green	30,000
	July 3, 1872	Salamanca, N. Y	Allegheny River	Ohio River	South Hadley Falls, Mass	Rev. Wm. Clift	400,000
North Carolina	May 13, 1873	New Berne, N. C	Neuse River	Pamlico Sound	New Berne, N. C	Not transferred	45,000
	May 26, 1876	Raleigh, N. C	Neuse River	Pamlico Sound	Ferry Landing, Va	C. D. Griswold	98,000
	June 12, 1876	Catawba, N. C	Catawba River	Santee River	Havre de Grace, Md	L. Kumlien	66,900
	May —, 1877	Wake County, N. C	Neuse River	Pamlico Sound	Havre de Grace, Md		134,000
	July 18, 1877	Rowan County, N. C	Yadkin River	Great Pedee River	South Hadley Falls, Mass	J. F. Ellis	70,000
	July 19, 1877	Alamance County, N. C	Haw River	Cape Fear River	South Hadley Falls, Mass	Ellis and Ingalls	70,000
	July 19, 1877	Catawba, N. C	Catawba River	Santee River	South Hadley Falls, Mass	F. A. Ingalls	60,000
	July 25, 1877	Wilson County, N. C	Contentnea Creek	Neuse River	South Hadley Falls, Mass	C. D. Griswold	50,000
	July 25, 1877	Granville County, N. C	Tar River	Pamlico Sound	South Hadley Falls, Mass	C. D. Griswold	50,000
	Apr. 11, 1878	Avoca, N. C	Salmon Creek	Chowan River	Avoca, N. C	Not transferred	2,500
	Apr. 11, 1878	Weldon, N. C	Roanoke River	Albemarle Sound	Avoca, N. C	W. G. Williamson	139,000
	Apr. 12, 1878	Neuse, N. C	Neuse River	Pamlico Sound	Avoca, N. C	S. G. Worth	100,000
	Apr. 12, 1878	Branchville, N. C	Meherrin River	Chowan River	Avoca, N. C	W. G. Williamson	150,000
	Apr. 15, 1878	The Mill, N. C	Salmon Creek	Chowan River	Avoca, N. C	Not transferred	120,000
	Apr. 20, 1878	Raleigh, N. C	Neuse River	Pamlico Sound	Avoca, N. C	H. E. Quinn	50,000
	Apr. 22, 1878	Granville County, N. C	Tar River	Pamlico Sound	Avoca, N. C	Thomas Taylor	100,000
	Apr. 24, 1878	Avoca, N. C	Salmon Creek	Chowan River	Avoca, N. C	Not transferred	800,000
	Apr. 24, 1878	Lockville, N. C	Cape Fear River	Atlantic Ocean	Avoca, N. C	Col. L. L. Polk	100,000
	Apr. 25, 1878	Avoca, N. C	Salmon Creek	Chowan River	Avoca, N. C	Not transferred	200,000
	Apr. 25, 1878	Colerain, N. C	Chowan River	Albemarle Sound	Avoca, N. C	Not transferred	200,000
	Apr. 25, 1878	Scotch Hall, Avoca, N. C	Albemarle Sound	Atlantic Ocean	Avoca, N. C	Not transferred	115,000
	Apr. 26, 1878	Plymouth, N. C	Roanoke River	Albemarle Sound	Avoca, N. C	Not transferred	250,000
	Apr. 26, 1878	Avoca, N. C	Chowan River	Albemarle Sound	Avoca, N. C	Not transferred	25,000
	Apr. 26, 1878	Scotch Hall, Avoca, N. C	Albemarle Sound	Atlantic Ocean	Avoca, N. C	Not transferred	70,000
	Apr. 26, 1878	Sampson County, N. C	Six Runs	North East Cape Fear River.	Avoca, N. C	Thomas Taylor	100,000
	Apr. 26, 1878	Duplin County, N. C	Goshen Creek	North East Cape Fear River.	Avoca, N. C	Thomas Taylor	100,000

D.—TABLE I.—*Distribution of shad from* 1872 *to* 1880, *inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where fish were hatched.	By whom transferred.	Estimated number of fish.
North Carolina—Continued.	Apr. 28, 1878	Avoca, N. C	Salmon Creek	Chowan River	Avoca, N. C	Not transferred	300,000
	Apr. 29, 1878	Avoca, N. C	Salmon Creek	Chowan River	Avoca, N. C	Not transferred	18,000
	May 1, 1878	Avoca, N. C	Salmon Creek	Chowan River	Avoca, N. C	Not transferred	45,000
	May 2, 1878	Avoca, N. C	Salmon Creek	Chowan River	Avoca, N. C	Not transferred	200,000
	May 2, 1878	Granville County, N. C	Tar River	Pamlico Sound	Avoca, N. C	Thomas Taylor	150,000
	June 7, 1878	Salisbury, N. C	Yadkin River	Great Pedee River	Havre de Grace, Md	S. G. Worth	50,000
	June 7, 1878	Catawba, N. C	Catawba River	Santee River	Havre de Grace, Md	S. G. Worth	50,000
	Apr. 18, 1879	Weldon, N. C	Roanoke River	Albemarle Sound	Avoca, N. C	C. J. Huske	100,000
	Apr. 21, 1879	Warsaw, N. C	Six Runs	Cape Fear River	Avoca, N. C	Thomas Taylor	100,000
	Apr. 21, 1879	Rocky Mount, N. C	Tar River	Pamlico Sound	Avoca, N. C	J. A. Woodward	100,000
	Apr. 24, 1879	Warsaw, N. C	Six Runs	Cape Fear River	Avoca, N. C	C. J. Huske	100,000
	Apr. 24, 1879	Pollocksville, N. C	Trent River	Pamlico Sound	Avoca, N. C	Thomas Taylor	145,000
	Apr. 24, 1879	Raleigh, N. C	Neuse River	Pamlico Sound	Avoca, N. C	Wm. M. Russ	115,000
	Apr. 24, 1879	Avoca, N. C	Albemarle Sound	Atlantic Ocean	Avoca, N. C	J. P. Haywood	60,000
	Apr. 24, 1879	Duplin County, N. C	Six Runs	Cape Fear River	Avoca, N. C	C. J. Huske	100,000
	Apr. 24, 1879	Avoca, N. C	Albemarle Sound	Atlantic Ocean	Avoca, N. C	S. G. Worth	50,000
	Apr. 25, 1879	Mount Olive, N. C	Goshen Creek	Cape Fear River	Avoca, N. C	J. A. Woodward	100,000
	Apr. 25, 1879	Rocky Mount, N. C	Tar River	Pamlico Sound	Avoca, N. C	W. M. Russ	100,000
	Apr. 29, 1879	Weldon, N. C	Roanoke River	Albemarle Sound	Avoca, N. C	J. A. Woodward	150,000
	Apr. 29, 1879	Avoca, N. C	Salmon Creek	Chowan River	Avoca, N. C	J. A. Woodward	75,000
	May 2, 1879	Weldon, N. C	Roanoke River	Albemarle Sound	Avoca, N. C	J. A. Woodward	100,000
	May 2, 1879	Raleigh, N. C	Neuse River	Pamlico Sound	Avoca, N. C	C. J. Huske	90,000
	May 3, 1879	Branchville, N. C	Meherrin River	Chowan River	Avoca, N. C	J. A. Woodward	150,000
	May 6, 1879	Salisbury, N. C	Yadkin River	Great Pedee River	Avoca, N. C	Huske and Taylor	100,000
	May 9, 1879	Avoca, N. C	Salmon Creek	Albemarle Sound	Avoca, N. C	W. M. Russ	210,000
	May 8, 1879	Avoca, N. C	Salmon Creek	Chowan River	Avoca, N. C	G. H. Williams	15,000
	May 9, 1879	Avoca, N. C	Salmon Creek	Chowan River	Avoca, N. C	G. H. Williams	215,000
	May 12, 1879	Avoca, N. C	Salmon Creek	Chowan River	Avoca, N. C	W. M. Russ	250,000
	May 13, 1879	Camden County, N. C	North River	Albemarle Sound	Avoca, N. C		500,000
Ohio	July 3, 1872	Kent, Ohio	Cuyahoga River	Lake Erie	South Hadley Falls, Mass	Rev. Wm. Clift	1,000
	June 24, 1873	Ashtabula, Ohio	Ashtabula River	Lake Erie	Coeymans, N. Y	J. Mason	50,000
	June 25, 1874	Eagleville, Ohio	Grand River	Lake Erie	Coeymans, N. Y	Chase and Mather	60,000
	June 26, 1874	Fremont, Ohio	Sandusky River	Lake Erie	Coeymans, N. Y	H. W. Welsher	60,000
	July 9, 1874	Bellefontaine, Ohio	Buckingahela River	Ohio River	Coeymans, N. Y	Mather and Yealey	75,000
	July 18, 1874	Elyria, Ohio	Black River	Ohio River	South Hadley Falls, Mass	O. M. Chase	65,000
	July 18, 1874	Monroeville, Ohio	Huron River	Ohio River	South Hadley Falls, Mass	H. W. Welsher	65,000
	June 15, 1875	Columbus, Ohio	Scioto River	Ohio River	Coeymans, N. Y	Mason and Ingalls	75,000
	June 23, 1875	Bayard, Ohio	Muskingum River	Ohio River	Coeymans, N. Y	F. N. Clark	100,000
	June 13, 1876	Janesville, Ohio	Muskingum River	Ohio River	Havre de Grace, Md	Ingalls and Fairfax	59,700
	June 26, 1876	Columbus, Ohio	Scioto River	Ohio River	Havre de Grace, Md	J. H. Klippart	75,000
	June 9, 1878	Fremont, Ohio	Sandusky River	Lake Erie	Havre de Grace, Md	H. E. Quinn	60,000
	June 7, 1879	Fremont, Ohio	Sandusky River	Lake Erie	Spesutie Narrows, Md	H. E. Quinn	100,000
	June 18, 1880	Fremont, Ohio	Sandusky River	Lake Erie	Potomac Station	C. W. Schuermann	200,000
Pennsylvania	June 18, 1873	Point Pleasant, Pa	Delaware River	Delaware Bay	Point Pleasant, Pa	Not transferred	28,000

	June 21, 1873	Point Pleasant, Pa	Delaware River	Delaware Bay	Point Pleasant, Pa	Not transferred	35,000
	June 25, 1873	Point Pleasant, Pa	Delaware River	Delaware Bay	Point Pleasant, Pa	Not transferred	30,000
	June 25, 1873	Greensburgh, Pa	Monongahela River	Ohio River	Point Pleasant, Pa	Dr. J. H. Slack	15,000
	June 26, 1873	Point Pleasant, Pa	Delaware River	Delaware Bay	Point Pleasant, Pa	Not transferred	100,000
	June 29, 1873	Point Pleasant, Pa	Delaware River	Delaware Bay	Point Pleasant, Pa	Not transferred	140,000
	June 30, 1873	Point Pleasant, Pa	Delaware River	Delaware Bay	Point Pleasant, Pa	Not transferred	100,000
	June 28, 1874	Point Pleasant, Pa	Delaware River	Delaware Bay	Point Pleasant, Pa	Not transferred	35,000
	June 29, 1874	Point Pleasant, Pa	Delaware River	Delaware Bay	Point Pleasant, Pa	Not transferred	75,000
	June 30, 1874	Point Pleasant, Pa	Delaware River	Delaware Bay	Point Pleasant, Pa	Not transferred	85,000
	July 2, 1874	Point Pleasant, Pa	Delaware River	Delaware Bay	Point Pleasant, Pa	Not transferred	60,000
	July 4, 1874	Point Pleasant, Pa	Delaware River	Delaware Bay	Point Pleasant, Pa	Not transferred	90,000
	July 6, 1874	Point Pleasant, Pa	Delaware River	Delaware Bay	Point Pleasant, Pa	Not transferred	20,000
	July 7, 1874	Point Pleasant, Pa	Delaware River	Delaware Bay	Point Pleasant, Pa	Not transferred	20,000
	July 8, 1874	Point Pleasant, Pa	Delaware River	Delaware Bay	Point Pleasant, Pa	Not transferred	65,000
	July 9, 1874	Point Pleasant, Pa	Delaware River	Delaware Bay	Point Pleasant, Pa	Not transferred	40,000
	July 15, 1874	Point Pleasant, Pa	Delaware River	Delaware Bay	Point Pleasant, Pa	Not transferred	40,000
	June 11, 1879	Harrisburgh, Pa	Susquehanna River	Chesapeake Bay	Spesutie Narrows, Md	J. P. Creveling	140,000
	May 17, 1880	Georgetown, Pa	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	J. P. Creveling	200,000
	May 22, 1880	Harrisburgh, Pa	Susquehanna River	Chesapeake Bay	Havre de Grace, Md	J. P. Creveling	250,000
Rhode Island	July 28, 1874	Bristol County, R. I	Warren River	Providence River	South Hadley Falls, Mass	J. F. Ellis	5,000
	July 28, 1874	Washington County, R. I	Pawcatuck River	Little Narragansett Bay	South Hadley Falls, Mass	J. F. Ellis	7,000
	July 28, 1874	Providence County, R. I	Pawtuxet River	Providence River	South Hadley Falls, Mass	J. F. Ellis	12,000
	July 28, 1874	Providence County, R. I	Blackstone River	Providence River	South Hadley Falls, Mass	J. F. Ellis	12,000
	July 23, 1875	Bristol County, R. I	Warren River	Providence River	South Hadley Falls, Mass	J. Mason *et al*	8,300
	July 23, 1875	Washington County, R. I	Pawcatuck River	Little Narragansett Bay	South Hadley Falls, Mass	J. Mason *et al*	13,800
	July 23, 1875	Providence County, R. I	Pawtuxet River	Providence River	South Hadley Falls, Mass	J. Mason *et al*	22,300
	July 23, 1875	Bristol County, R. I	Barrington River	Warren River	South Hadley Falls, Mass	J. Mason *et al*	5,600
	July 14, 1877	Providence County, R. I	Blackstone River	Providence River	South Hadley Falls, Mass	Mr. Rounds	50,000
	July 18, 1877	Bristol County, R. I	Warren River	Providence River	South Hadley Falls, Mass	Mr. Rounds	25,000
	July 18, 1877	Bristol County, R. I	Barrington River	Warren River	South Hadley Falls, Mass	Mr. Rounds	25,000
South Carolina	July 10, 1875	Gaffney's, S. C	Broad River	Santee River	South Hadley Falls, Mass	Clark and Quinn	80,000
	June 9, 1876	Spartanburgh C. H., S. C	Broad River	Santee River	Havre de Grace, Md	Griswold and Quinn	50,000
	June 1, 1878	Marion County, S. C	Great Pedee River	Winyah Bay	Havre de Grace, Md	S. G. Worth	50,000
	June 1, 1878	Columbia, S. C	Broad River	Santee River	Havre de Grace, Md	S. G. Worth	50,000
	May 3, 1879	Charleston County, S. C	Cooper River	Charleston Harbor	Avoca, N. C	J. A. Woodward	75,000
	May 24, 1880	Marion County, S. C	Great Pedee River	Winyah Bay	Potomac Station	S. M. Rixey	40,000
	May 24, 1880	Nichols, S. C	Little Pedee River	Great Pedee River	Potomac Station	S. M. Rixey	40,000
	May 24, 1880	Gaffney City, S. C	Broad River	Congaree River	Potomac Station	C. J. Huske	375,000
	May 24, 1880	Seneca, S. C	Seneca River	Savannah River	Potomac Station	C. J. Huske	375,000
	May 24, 1880	Rock Hill, S. C	Catawba River	Watcree River	Potomac Station	J. F. Ellis	60,000
	May 24, 1880	Columbia, S. C	Broad River	Santee River	Potomac Station	J. F. Ellis	140,000
	May 24, 1880	Richland County, S. C	Watcree River	Santee River	Potomac Station	S. M. Rixey	40,000
	May 24, 1880	Sumter County, S. C	Lynch's Creek	Great Pedee River	Potomac Station	S. M. Rixey	40,000
	May 30, 1880	Columbia, S. C	Broad River	Santee River	Potomac Station	C. J. Huske	200,000
Tennessee	July 10, 1875	Nashville, Tenn	Cumberland River	Ohio River	South Hadley Falls, Mass	Chase and Boehm	80,000
	July 10, 1875	Nashville, Tenn	Cumberland River	Ohio River	South Hadley Falls, Mass	Chase and Boehm	80,000
	July 10, 1875	Knoxville, Tenn	Holston River	Tennessee River	South Hadley Falls, Mass	Mason and Ingalls	100,000
	May 31, 1876	Knoxville, Tenn	Holston River	Tennessee River	Havre de Grace, Md	J. D. McNaughton	72,200
	May 31, 1876	Athens, Tenn	Eastanalbee River	Tennessee River	Havre de Grace, Md	B. S. Cory, jr	54,300
	May 31, 1876	Chattanooga, Tenn	Tennessee River	Ohio River	Havre de Grace, Md	F. A. Ingalls	72,300
	July 17, 1876	Jackson, Tenn	Forked Deer River	Mississippi River	South Hadley Falls, Mass	S. M. Gilmore	99,000
	July 17, 1876	Brownsville, Tenn	Big Hatchee River	Mississippi River	South Hadley Falls, Mass	C. D. Griswold	99,000

D.—TABLE I.—*Distribution of shad from 1872 to 1880, inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where fish were hatched.	By whom transferred.	Estimated number of fish.
Tennessee—Continued.	July 12, 1877	Jackson, Tenn	Forked Deer River	Mississippi River	South Hadley Falls, Mass	F. A. Ingalls	118,000
	May 18, 1878	Humboldt, Tenn	Middle Fork	Forked Deer River	Havre de Grace, Md	H. E. Quinn	50,000
	May 18, 1878	Huntingdon, Tenn	South Fork of Obion River	Mississippi River	Havre de Grace, Md	H. E. Quinn	50,000
	June 2, 1879	Nashville, Tenn	Cumberland River	Ohio River	Spesutie Narrows, Md	C. W. Schuermann	100,000
	June 2, 1879	Johnsonville, Tenn	Tennessee River	Ohio River	Spesutie Narrows, Md	C. W. Schuermann	75,000
	June 2, 1879	Dresden, Tenn	East Obion River	Mississippi River	Spesutie Narrows, Md	C. W. Schuermann	25,000
	June 2, 1879	Paducah Junction, Tenn	West Obion River	Mississippi River	Spesutie Narrows, Md	C. W. Schuermann	50,000
	June 13, 1879	Knoxville, Tenn	Holston River	Tennessee River	Old Bay Fishery, Md	J. F. Ellis	20,000
	June 13, 1879	Chattanooga, Tenn	Tennessee River	Ohio River	Old Bay Fishery, Md	J. F. Ellis	15,000
Texas	July 3, 1874	Hempstead, Tex	Brazos River	Gulf of Mexico	Coeymans, N. Y	Milner and Mason	20,000
	July 4, 1874	Austin, Tex	Colorado River	Matagorda Bay	Coeymans, N. Y	Milner and Clark	40,000
	July 4, 1875	Austin, Tex	Colorado River	Matagorda Bay	Coeymans, N. Y	Mason and Marks	60,000
	May 19, 1879	Mineola, Tex	Sabine River	Gulf of Mexico	Spesutie Narrows, Md	H. E. Quinn	100,000
	May 19, 1879	Dallas, Tex	Trinity River	Gulf of Mexico	Spesutie Narrows, Md	H. E. Quinn	100,000
	May 21, 1879	Hearne, Tex	Brazos River	Gulf of Mexico	Spesutie Narrows, Md	L. Kumlien	90,000
	May 21, 1879	Austin, Tex	Colorado River	Gulf of Mexico	Spesutie Narrows, Md	L. Kumlien	85,000
	May 22, 1879	Columbus, Tex	Colorado River	Gulf of Mexico	Spesutie Narrows, Md	C. W. Schuermann	50,000
	May 22, 1879	Luling, Tex	San Marcus River	Guadalupe	Spesutie Narrows, Md	C. W. Schuermann	50,000
	May 22, 1879	Seguin, Tex	Guadalupe River	Gulf of Mexico	Spesutie Narrows, Md	C. W. Schuermann	50,000
	May 22, 1879	San Antonio, Tex	San Antonio River	Gulf of Mexico	Spesutie Narrows, Md	C. W. Schuermann	50,000
Utah	June 30, 1873	Jordan, Utah	Jordan River	Great Salt Lake	Coeymans, N. Y	L. Stone and H. W. Welsher.	5,000
Vermont	July 5, 1873	Burlington, Vt	Winooski River	Lake Champlain	South Hadley Falls, Mass	J. W. Milner and J. Mason.	100,000
	July 20, 1873	Vergennes, Vt	Otter Creek	Lake Champlain	South Hadley Falls, Mass	J. W. Milner and J. Mason.	100,000
	July —, 1873	Brattleboro', Vt	West River	Connecticut River	South Hadley Falls, Mass	U. S. Fish Commission	100,000
	July —, 1873	Bellows Falls, Vt	Saxton's River	Connecticut River	South Hadley Falls, Mass	U. S. Fish Commission	100,000
	July 15, 1874	Bellows Falls, Vt	Connecticut River	Long Island Sound	South Hadley Falls, Mass	Mather and Vealey	215,000
	July 27, 1874	Bellows Falls, Vt	Connecticut River	Long Island Sound	South Hadley Falls, Mass	Chase and Brooks	140,000
	July 28, 1874	Vergennes, Vt	Otter Creek	Lake Champlain	South Hadley Falls, Mass	Chase and Brooks	150,000
	Aug. 1, 1874	Bellows Falls, Vt	Connecticut River	Long Island Sound	South Hadley Falls, Mass	Mather and Vealey	120,000
	Aug. 11, 1874	Winooski, Vt	Winooski River	Lake Champlain	South Hadley Falls, Mass	Brooks and Griswold	120,000
	Aug. 12, 1874	Swanton, Vt	Missisquoi River	Lake Champlain	South Hadley Falls, Mass	Brooks and Griswold	80,000
	Aug. 12, 1874	Georgia, Vt	Lamoille River	Lake Champlain	South Hadley Falls, Mass	Brooks and Griswold	80,000
	Aug. 20, 1874	Bellows Falls, Vt	Connecticut River	Long Island Sound	South Hadley Falls, Mass	H. J. Brooks	30,000
	July 7, 1875	South Vernon, Vt	Connecticut River	Long Island Sound	South Hadley Falls, Mass	Griswold and Quinn	200,000
	July 17, 1875	South Vernon, Vt	Connecticut River	Long Island Sound	South Hadley Falls, Mass	Griswold and Quinn	280,000
	July 28, 1875	Georgia, Vt	Lamoille River	Lake Champlain	South Hadley Falls, Mass	O. M. Chase	70,000
	July 10, 1876	Bellows Falls, Vt	Connecticut River	Long Island Sound	South Hadley Falls, Mass	A. D. Hager	300,000
	July 28, 1876	Bellows Falls, Vt	Connecticut River	Long Island Sound	South Hadley Falls, Mass	A. D. Hager	75,000
	July 30, 1876	Bellows Falls, Vt	Connecticut River	Long Island Sound	South Hadley Falls, Mass	A. D. Hager	30,000
	Aug. 7, 1876	Bellows Falls, Vt	Connecticut River	Long Island Sound	South Hadley Falls, Mass	A. D. Hager	240,000
	July 9, 1877	Waterbury, Vt	Winooski River	Lake Champlain	South Hadley Falls, Mass	R. E. Earll	90,000

Virginia	May 25, 1873	Jackson City, Va	Potomac River	Chesapeake Bay	Jackson City, Va	Not transferred	200,000
	May 26, 1873	Jackson City, Va	Potomac River	Chesapeake Bay	Jackson City, Va	Not transferred	220,000
	May 27, 1873	Jackson City, Va	Potomac River	Chesapeake Bay	Jackson City, Va	Not transferred	275,000
	May 28, 1873	Jackson City, Va	Potomac River	Chesapeake Bay	Jackson City, Va	Not transferred	155,000
	May 29, 1873	Jackson City, Va	Potomac River	Chesapeake Bay	Jackson City, Va	Not transferred	100,000
	May 30, 1872	Jackson City, Va	Potomac River	Chesapeake Bay	Jackson City, Va	Not transferred	50,000
	May 31, 1873	Jackson City, Va	Potomac River	Chesapeake Bay	Jackson City, Va	Not transferred	50,000
	June 5, 1873	Jackson City, Va	Potomac River	Chesapeake Bay	Jackson City, Va	Not transferred	100,000
	June 6, 1873	Jackson City, Va	Potomac River	Chesapeake Bay	Jackson City, Va	Not transferred	75,000
	June 7, 1873	Jackson City, Va	Potomac River	Chesapeake Bay	Jackson City, Va	Not transferred	125,000
	June 8, 1873	Jackson City, Va	Potomac River	Chesapeake Bay	Jackson City, Va	Not transferred	20,000
	July 10, 1873	Central, Va	New River	Kanawha River	Jackson City, Va	H. W. Welsher	40,000
	May 21, 1875	Free Stone Point, Va	Potomac River	Chesapeake Bay	Free Stone Point, Va	Not transferred	103,500
	May 22, 1875	Free Stone Point, Va	Potomac River	Chesapeake Bay	Free Stone Point, Va	Not transferred	215,000
	May 23, 1875	Free Stone Point, Va	Potomac River	Chesapeake Bay	Free Stone Point, Va	Not transferred	472,000
	May 24, 1875	Free Stone Point, Va	Potomac River	Chesapeake Bay	Free Stone Point, Va	Not transferred	266,250
	May 25, 1875	Free Stone Point, Va	Potomac River	Chesapeake Bay	Free Stone Point, Va	Not transferred	100,000
	May 23–6, '75	Jackson City, Va	Potomac River	Chesapeake Bay	Jackson City, Va	Not transferred	102,000
	May 24–6, '75	Ferry Landing, Va	Potomac River	Chesapeake Bay	Ferry Landing, Va	Not transferred	220,000
	May 27, 1875	Ferry Landing, Va	Potomac River	Chesapeake Bay	Ferry Landing, Va	Not transferred	185,000
	May 28, 1875	Ferry Landing, Va	Potomac River	Chesapeake Bay	Ferry Landing, Va	Not transferred	260,000
	May 29, 1875	Ferry Landing, Va	Potomac River	Chesapeake Bay	Ferry Landing, Va	Not transferred	250,000
	May 27–9, '75	Jackson City, Va	Potomac River	Chesapeake Bay	Jackson City, Va	Not transferred	110,000
	May 30, 1875	Ferry Landing, Va	Potomac River	Chesapeake Bay	Ferry Landing, Va	Not transferred	200,000
	May 31, 1875	Ferry Landing, Va	Potomac River	Chesapeake Bay	Ferry Landing, Va	Not transferred	300,000
	May 31, 1875	Jackson City, Va	Potomac River	Chesapeake Bay	Jackson City, Va	Not transferred	20,000
	June 1, 1875	Ferry Landing, Va	Potomac River	Chesapeake Bay	Ferry Landing, Va	Not transferred	58,500
	June 1–4, '75	Jackson City, Va	Potomac River	Chesapeake Bay	Jackson City, Va	Not transferred	540,800
	June 5–8, '75	Jackson City, Va	Potomac River	Chesapeake Bay	Jackson City, Va	Not transferred	300,000
	July 8, 1875	Staunton Station, Va	Staunton River	Roanoke River	Point Pleasant, Va	Anderson & Bell	100,000
	May 8–24, '75	Ferry Landing, Va	Potomac River	Chesapeake Bay	Ferry Landing, Va	Not transferred	586,000
	May 25, 1876	Staunton Station, Va	Staunton River	Roanoke River	Havre de Grace, Md	B. S. Cory, jr	59,900
	May 25, 1876	Central, Va	New River	Kanawha River	Havre de Grace, Md	F. A. Ingalls	59,500
	May 27, 1876	Marion, Va	Holston River	Tennessee River	Havre de Grace, Md	Anderson & Kumlion	74,700
	June 11, 1876	Danville, Va	Dan River	Roanoke River	Havre de Grace, Md	T. H. Bean	80,500
	July 16, 1877	Halifax County, Va	Dan River	Roanoke River	South Hadley Falls, Mass	H. E. Quinn	110,000
	Apr. 11, 1878	Nottoway, Va	Nottoway River	Chowan River	Avoca, N. C	W. G. Williamson	111,000
	Apr. 13, 1878	Richmond, Va	James River	Chesapeake Bay	Avoca, N. C	W. G. Williamson	115,000
	Apr. 22, 1878	Suffolk, Va	South branch Nansemond River.	James River	Avoca, N. C	H. B. Nicholas	40,000
	Apr. 24, 1878	Salem, Va	Roanoke River	Albemarle Sound	Avoca, N. C	W. F. Page	100,000
	Apr. 25, 1878	Petersburg, Va	Appomattox River	James River	Avoca, N. C	H. B. Nicholas	60,000
	Apr. 30, 1878	Milford, Va	Mattapony River	York River	Avoca, N. C	H. B. Nicholas	90,000
	May 1, 1878	Milford, Va	Mattapony River	York River	Avoca, N. C	H. D. Johnson	90,000
	May 1, 1878	Taylorsville, Va	Little River	South Anne River	Avoca, N. C	W. F. Page	100,000
	May 2, 1878	Franklin, Va	Blackwater River	Chowan River	Avoca, N. C	Thomas Taylor	150,000
	May 2, 1878	Franklin, Va	Blackwater River	Chowan River	Avoca, N. C	Thomas Taylor	100,000
	May 3, 1878	Suffolk, Va	South branch Nansemond River.	James River	Avoca, N. C	Page & Johnson	50,000
	May 23, 1878	Freestone, Va	Potomac River	Chesapeake Bay	Steamer Lookout	Not transferred	50,000
	May 28, 1878	Riverton, Va	Shenandoah River	Potomac River	Havre de Grace, Md	W. F. Page	200,000
	June 1, 1878	Shadwell, Va	Rivanna River	James River	Havre de Grace, Md	W. F. Page	175,000

D.—TABLE I.—*Distribution of shad from* 1872 *to* 1880, *inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where fish were hatched.	By whom transferred.	Estimated number of fish.
Virginia—Continued.	June 4, 1878	Waynesborough, Va	South River	Shenandoah River	Steamer Lookout	W. F. Page	150,000
	Apr. 26, 1878	Franklin, Va	Blackwater River	Chowan River	Avoca, N. C	Thomas Taylor	200,000
	Apr. 26, 1878	Suffolk, Va	Nansemond River	Hampton Roads	Avoca, N. C	W. G. Williamson	75,000
	May 2, 1879	Franklin, Va	Blackwater River	Chowan River	Avoca, N. C	Thomas Taylor	120,000
	May 3, 1879	Franklin, Va	Blackwater River	Chowan River	Avoca, N. C	S. G. Worth	25,000
	May 6, 1879	Nottoway, Va	Nottoway River	Chowan River	Avoca, N. C	Woodward & Williams	100,000
	May 7, 1879	Nottoway, Va	Nottoway River	Chowan River	Avoca, N. C	G. H. Williams	75,000
	May 7, 1879	Franklin, Va	Blackwater River	Chowan River	Avoca, N. C	J. A. Woodward	150,000
	May 7, 1879	Franklin, Va	Blackwater River	Chowan River	Avoca, N. C	W. M. Russ	75,000
	May 7, 1879	Franklin, Va	Blackwater River	Chowan River	Avoca, N. C	W. M. Russ	95,000
	May 13, 1879	Nottoway, Va	Nottoway River	Chowan River	Avoca, N. C	Taylor & Woodward	100,000
	May 14, 1879	Franklin, Va	Blackwater River	Chowan River	Avoca, N. C	J. F. Ellis	80,000
	May 19, 1880	Petersburg, Va	Appomattox River	James River	Potomac Station	S. M. Rixey	160,000
West Virginia	June 6, 1873	Ronceverte, W. Va	Greenbrier River	Kanawha River	Jackson City, Va	J. W. Milner	30,000
	June —, 1876	Piedmont, W. Va	Potomac River	Chesapeake Bay	Havre de Grace, Md	U. S. Fish Commission	200,000
	June 3, 1879	Piedmont, W. Va	Potomac River	Chesapeake Bay	Spesutie Narrows, Md	H. E. Quinn	200,000
	June 9, 1879	Rowlesburg, W. Va	Cheat River	Ohio River	Spesutie Narrows, Md	L. Kumlien	65,000
	June 9, 1879	Grafton, W. Va	Tygart's Valley River	Ohio River	Spesutie Narrows, Md	L. Kumlien	65,000
	June 9, 1879	Clarksburg, W. Va	West Fork River	Ohio River	Spesutie Narrows, Md	L. Kumlien	70,000
	June 13, 1879	Hinton, W. Va	New River	Ohio River	Spesutie Narrows, Md	H. E. Quinn	65,000
	June 13, 1879	Ronceverte, W. Va	Greenbrier River	Kanawha River	Spesutie Narrows, Md	H. E. Quinn	60,000
Wisconsin	June 20, 1873	Appleton, Wis	Fox River	Lake Michigan	Coeyman's, N. Y	J. W. Milner & J. Mason	70,000
	June 12, 1877	Appleton, Wis	Fox River	Green Bay	Spesutie Narrows, Md	J. W. Milner	100,000
							97,373,250

D.—TABLE II.—*Distribution of California salmon from 1873 to 1880, inclusive.*

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Estimated number of fish.
Alabama	Dec. 18, 1876	Montgomery, Ala	Alabama River	Mobile River	Northville, Mich	28,600
	Dec. 29, 1878	Oxford, Ala	Cold Water Creek	Coosa River	Baltimore, Md	2,000
Arkansas	Dec. —, 1878	Little Rock, Ark	Arkansas River	Mississippi River	Northville, Mich	1,000
	Dec. —, 1878	Little Rock, Ark	Arkansas River	Mississippi River	Northville, Mich	1,000
	Dec. —, 1878	Arkadelphia, Ark	Quactuto River	Washita River	Northville, Mich	1,000
	Dec. —, 1878	Newport, Ark	White River	Mississippi River	Northville, Mich	1,000
	Dec. —, 1878	Benton, Ark	Saline River	Washita River	Northville, Mich	1,000
	Dec. —, 1878	Benton, Ark	Saline River	Washita River	Northville, Mich	1,000
	Dec. —, 1878	Arkadelphia, Ark	Quactuto River	Washita River	Northville, Mich	1,000
	Dec. —, 1878	Newport, Ark	White River	Mississippi River	Northville, Mich	1,000
	Dec. —, 1878	Arkadelphia, Ark	Quactuto River	Washita River	Northville, Mich	1,000
California	Sept. —, 1873	Baird, Cal	McCloud River	Sacramento River	U. S. Station, McCloud River	500,000
	Sept. —, 1874	Baird, Cal	McCloud River	Sacramento River	U. S. Station, McCloud River	500,000
	Sep.-Oct., '75	Baird, Cal	McCloud River	Sacramento River	U. S. Station, McCloud River	850,000
	1876	San Francisco, Cal	Private fish farm	Sacramento River	Alameda County	10,000
	1876	San Francisco, Cal	Woodward's Gardens	Sacramento River	San Francisco, Cal	10,000
	Sep.-Oct., '76	Baird, Cal	McCloud River	Sacramento River	U. S. Station, McCloud River	1,500,000
	Sept. —, 1877		Clackamas River	Columbia River	Clackamas River	1,000,000
	Oct. —, 1877	Baird, Cal	McCloud River	Sacramento River	U. S. Station, McCloud River	2,200,000
	Oct. —, 1878	Baird, Cal	McCloud River	Sacramento River	U. S. Station, McCloud River	2,500,000
	Dec. —, 1878		Clackamas River	Columbia River	Clackamas River	1,203,000
	Oct. —, 1879	Baird, Cal	McCloud River	Sacramento River	U. S. Station, McCloud River	2,000,000
	Oct. —, 1880	Baird, Cal	McCloud River	Sacramento River	U. S. Station, McCloud River	2,000,000
Colorado	1874	Georgetown, Colo	Green Lake	South Platte River	Georgetown, Colo	11,450
	1874	Georgetown, Colo	Clear Lake	South Platte River	Georgetown, Colo	11,450
	1875	Georgetown, Colo	Green Lake	South Platte River	Georgetown, Colo	200,000
	1876	Georgetown, Colo	Green Lake	South Platte River	Georgetown, Colo	250,000
Connecticut	Dec. 11, 1874	Colebrook, Conn	Farmington River	Connecticut River	Wallonian hatching-house	5,000
	Dec. 20, 1873	Northford, Conn	West River	Connecticut River	North Branford, Conn	6,000
	Jan. 1, 1874	Durham, Conn	West River	Connecticut River	North Branford, Conn	15,000
	Spring, 1874	North Branford, Conn	Mill River	Long Island Sound	North Branford, Conn	24,000
	Dec. 18, 1874	New Milford, Conn	Butler Brook	Housatonic River	Westport, Conn	50,000
	Dec. 18, 1874	————, Conn	Quinnepiac River	Long Island Sound	N. Y. State hatching-house	2,700
	Dec. 21, 1874	Pine Meadow, Conn	Farmington River	Connecticut River	Westport, Conn	50,000
	Dec. 23, 1874	Pine Meadow, Conn	Farmington River	Connecticut River	Westport, Conn	20,000
	Dec. 26, 1874		Shetucket River	Thames River	North Branford, Conn	50,000
	Dec. 30, 1874	Durham, Conn	Cocnochogue River	Connecticut River	North Branford, Conn	50,000
	Jan. 20, 1875	New Haven, Conn	Farm River	Long Island Sound	North Branford, Conn	20,000
	Feb. 10, 1875	————, Conn	Quinnepiac River	Long Island Sound	N. Y. State hatching-house	3,000
	Dec. —, 1875	North Windham, Conn	Natchaug River	Thames River	Westport, Conn	50,000
	Dec. —, 1875	New Milford, Conn	Housatonic River	Long Island Sound		110,000
	Dec. —, 1875	New Hartford, Conn	Farmington River	Connecticut River		300,000
	1876		Farmington River	Connecticut River		300,000
	1876		Housatonic River	Long Island Sound		100,000

D.—TABLE II.—*Distribution of California salmon from* 1873 *to* 1880, *inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Estimated number of fish.
Connecticut—Continued.	1876		Saugatuck River	Long Island Sound		27,286
	1876		Natchaug River	Thames River		50,000
Delaware	Dec. 6, 1876	Seaford, Del	Nanticoke River	Tangier Sound	Baltimore, Md	10,400
	Dec. 16, 1878	Seaford, Del	Nanticoke River	Tangier Sound	Baltimore, Md	10,000
	Nov. 28, 1880	Seaford, Del	Little Nanticoke River	Chesapeake Bay		6,000
	Dec. 3, 1880	Seaford, Del	Little Nanticoke River	Chesapeake Bay		5,000
Georgia	Dec. 22, 1876	Resaca, Ga	Coosa River	Alabama River	Baltimore, Md	5,000
	Dec. 22, 1876	Cartersville, Ga	Etowah River	Alabama River	Baltimore, Md	5,000
	Dec. 22, 1876	Oconee, Ga	Oconee River	Altamaha River	Baltimore, Md	10,000
	Dec. 22, 1876	Crawfordsville, Ga	Ogeechee River	Ossabaw Sound	Baltimore, Md	10,000
	Jan. 10, 1877	Tocoa, Ga	Tugalo River	Savannah River	Baltimore, Md	5,000
	Jan. 10, 1877	Crawfordsville, Ga	Ogeechee River	Ossabaw River	Baltimore, Md	7,500
	Jan. 10, 1877	Norcross, Ga	Chattahoochee River	Apalachicola River	Baltimore, Md	7,500
	Dec. 21, 1878	Milledgeville, Ga	Oconee River	Altamaha River	Baltimore, Md	3,750
	Dec. 21, 1878	Macon, Ga	Ocmulgee River	Altamaha River	Baltimore, Md	3,750
	Dec. 21, 1878	Covington, Ga	Yellow River	Ocmulgee River	Baltimore, Md	3,750
	Dec. 21, 1878	Covington, Ga	Ocmulgee River	Altamaha River	Baltimore, Md	3,750
	Dec. 28, 1878	Gainesville, Ga	Chattahoochee River	Apalachicola River	Baltimore, Md	3,000
	Dec. 28, 1878	Baldings Mills, Ga	Chastatee River	Chattahoochee River	Baltimore, Md	3,000
	Dec. 28, 1878	Jonesborough, Ga	Flint River	Apalachicola River	Baltimore, Md	4,000
	Dec. 28, 1878	Cartersville, Ga	Etowah River	Coosa River	Baltimore, Md	2,000
	Dec. 28, 1878	Resaca, Ga	Coosa River	Alabama River	Baltimore, Md	2,000
Illinois	May 12, 1874	Kensington, Ill	Calumet River	Lake Michigan	Pokagon, Mich	25,000
	Dec. 22, 1874	Rockford, Ill	Rock River	Mississippi River	Northville, Mich	15,000
	Dec. 14, 1874	Elgin, Ill	Fox River	Mississippi River	Pokagon, Mich	20,000
	Jan. 26, 1875	Rockford, Ill	Rock River	Mississippi River	Northville, Mich	20,000
	Dec. 29, 1875	Elgin, Ill	Fox Lake	Mississippi River	Northville, Mich	18,700
	Dec. 29, 1875	Elgin, Ill	Twin Lake	Mississippi River	Northville, Mich	20,000
	Dec. 29, 1876	Sand Lake, Ill	Deep Lake	Illinois River	Northville, Mich	2,500
	Fall of 1876	Belleville, Ill	Prairie du Pont River	Mississippi River	Belleville, Ill	20,000
	Fall of 1876		Kankakee River	Illinois River	Elgin, Ill	25,000
	Fall of 1876		Illinois River	Mississippi River	Elgin, Ill	25,000
	Fall of 1876		Rock River	Mississippi River	Elgin, Ill	15,000
	Fall of 1876		Fox River	Illinois River	Elgin, Ill	73,000
	Spring, 1877	Belleville, Ill	Prairie du Pont River	Mississippi River	Belleville, Ill	10,000
	Spring, 1877	Belleville, Ill	Kaskaskia River	Mississippi River	Belleville, Ill	10,000
	Spring, 1877	Belleville, Ill	Mississippi River	Gulf of Mexico	Belleville, Ill	10,000
	Oct. —, 1877	Burritt, Ill	Knapp's Creek	Pecatonia River	Rockford, Ill	25,000
	Nov. —, 1877	Owen, Ill	Brown's Creek	Rock River	Rockford, Ill	10,000
	Nov. —, 1877	Rockford, Ill	Kent's Creek	Rock River	Rockford, Ill	10,000
	Dec. 14, 1877	Jacksonville, Ill	Lake	Illinois River	Elgin, Ill	10,000
	Dec. 25, 1877	McHenry, Ill	Column Lake	Fox River	Elgin, Ill	5,000
	Dec. 28, 1877	Mount Carroll, Ill	Carroll Creek	Plum River	Elgin, Ill	5,000
	1877	Arlington Heights, Ill	Small Lake	Des Moines River	Elgin, Ill	1,000

	Jan. —, 1878		Kankakee River	Illinois River	Elgin, Ill	10,000
	Jan. —, 1879	Crystal Lake, Ill	Crystal Lake	Fox River	Geneva Lake, Ill	20,000
	Jan. —, 1879	Rockford, Ill	Rock River	Illinois River	Geneva Lake, Ill	50,000
	Jan. —, 1879	Cary Station, Ill	Fox River	Illinois River	Geneva Lake, Ill	20,000
	Spring, 1879	Mount Carroll, Ill	Carroll Creek	Plum River	Mount Carroll, Ill	40,000
Indiana	Dec. 16, 1874	Indianapolis, Ind	White River	Wabash River	Pokagon, Mich	16,000
	Dec. 24, 1874	Guilford, Ind	Tanner's Creek	Ohio River	Pokagon, Mich	15,000
	Dec. 4, 1875	Laporte, Ind	Kankakee River	Illinois River	Northville, Mich	30,000
	Dec. 14, 1875	Warren, Ind	Grapevine Creek	Kankakee River	Pokagon, Mich	262,000
	Jan. 4, 1876	Wabash, Ind	Wabash River	Ohio River	Northville, Mich	25,000
	Jan. 17, 1876	Michigan City, Ind	Kankakee River	Illinois River	Northville, Mich	2,000
	Dec. 21–6, '76	Wabash, Ind	Wabash River	Ohio River	Northville, Mich	73,500
	Dec. 30, 1876	Guilford, Ind	Tanner's Creek	Ohio River	Northville, Mich	20,000
Iowa	Dec. 2, 1874	Des Moines, Iowa	Des Moines River	Mississippi River	Anamosa, Iowa	5,200
	Dec. 5, 1874	Waterloo, Iowa	Cedar River	Mississippi River	Anamosa, Iowa	3,500
	Dec. 8, 1874	Monticello, Iowa	Maquoketa River	Mississippi River	Anamosa, Iowa	7,000
	Dec. 11, 1874	Maquoketa, Iowa	Maquoketa River	Mississippi River	Anamosa, Iowa	7,000
	Dec. 12, 1874	Cedar Rapids, Iowa	Cedar River	Mississippi River	Anamosa, Iowa	12,000
	Dec. 12, 1874	Marion, Iowa	Cedar River	Mississippi River	Anamosa, Iowa	3,000
	Dec. 15, 1874	Farley, Iowa	Little Maquoketa River	Mississippi River	Anamosa, Iowa	2,500
	Dec. 15, 1874	Epworth, Iowa	Little Maquoketa River	Mississippi River	Anamosa, Iowa	3,500
	Dec. 15, 1874	Fredericksburgh, Iowa	Upper Iowa River	Mississippi River	Anamosa, Iowa	300
	Dec. 15, 1874	McGregor, Iowa	Bloody Run	Mississippi River	Anamosa, Iowa	5,700
	Dec. 18, 1874	Tipton, Iowa	Cedar Run	Mississippi River	Anamosa, Iowa	4,100
	Dec. 18, 1874	Iowa Falls, Iowa	Iowa River	Cedar River	Anamosa, Iowa	10,000
	Dec. 18, 1874	Fort Dodge, Iowa	Des Moines River	Mississippi River	Anamosa, Iowa	15,000
	Dec. 27, 1874	Clinton Junction, Iowa	Mississippi River	Gulf of Mexico	Anamosa, Iowa	2,500
	Dec. 27, 1874	Charlotte, Iowa	Maquoketa River	Mississippi River	Anamosa, Iowa	2,500
	Dec. 28, 1874	Dixon, Iowa	Big Rock Creek	Wapsipinicon River	Anamosa, Iowa	2,500
	Dec. 28, 1874	Big Rock, Iowa	Big Rock Creek	Wapsipinicon River	Anamosa, Iowa	2,500
	Dec. 28, 1874	Anamosa, Iowa	Wapsipinicon River	Mississippi River	Anamosa, Iowa	5,000
	Jan. 4, 1875	Waukon, Iowa	Paint Creek	Mississippi River	Anamosa, Iowa	700
	Jan. 4, 1875	Worthington, Iowa	Maquoketa River	Mississippi River	Anamosa, Iowa	2,000
	Jan. 5, 1875	Atlantic, Iowa	Nishnabotany River	Missouri River	Anamosa, Iowa	6,000
	Jan. 6, 1875	Delhi, Iowa	Maquoketa River	Mississippi River	Anamosa, Iowa	400
	Jan. 6, 1875	Hopkinton, Iowa	Maquoketa River	Mississippi River	Anamosa, Iowa	400
	Jan. 6, 1875	Greeley, Iowa	Volga River	Turkey River	Anamosa, Iowa	600
	Jan. 6, 1875	Fayette, Iowa	Volga River	Turkey River	Anamosa, Iowa	14,000
	Jan. 6, 1875	Delaware, Iowa	Spring Creek	Maquoketa River	Anamosa, Iowa	4,600
	Jan. 11, 1875	Ottumwa, Iowa	Des Moines River	Mississippi River	Anamosa, Iowa	11,000
	Jan. 12, 1875	Des Moines, Iowa	Des Moines River	Mississippi River	Anamosa, Iowa	5,200
	Jan. 12, 1875	Polk County, Iowa	Brown's Creek	Mississippi River	Anamosa, Iowa	500
	Jan. 12, 1875	Polk County, Iowa	Raccoon Creek	Des Moines River	Anamosa, Iowa	500
	Jan. 18, 1875	Oxford, Iowa	Wapsipinicon River	Mississippi River	Anamosa, Iowa	10,500
	Jan. 18, 1875	Iowa City, Iowa	Iowa River	Mississippi River	Anamosa, Iowa	3,500
	Jan. 18, 1875	Wilton, Iowa	Cedar River	Iowa River	Anamosa, Iowa	3,500
	Jan. 18, 1875	Anamosa, Iowa	Wapsipinicon River	Mississippi River	Anamosa, Iowa	6,000
	Jan. 27, 1875	Springville, Iowa	Cedar River	Iowa River	Anamosa, Iowa	3,500
	Jan. 27, 1875	Independence, Iowa	Wapsipinicon River	Mississippi River	Anamosa, Iowa	10,500
	Jan. 27, 1875	Walker, Iowa	Cedar River	Iowa River	Anamosa, Iowa	3,500
	Jan. 27, 1875	Clermont, Iowa	Turkey River	Mississippi River	Anamosa, Iowa	3,500
	Jan. 27, 1875	Maynard, Iowa	Volga River	Turkey River	Anamosa, Iowa	3,500

D.—TABLE II.—*Distribution of California salmon from* 1873 *to* 1880, *inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Estimated number of fish.
Iowa—Continued.	Feb. 1, 1875	Cherokee, Iowa	Little Sioux River	Missouri River	Anamosa, Iowa	10,000
	Feb. 1, 1875	Le Mars, Iowa	Floyd River	Missouri River	Anamosa, Iowa	5,000
	Feb. 1, 1875	Sioux City, Iowa	Floyd River	Missouri River	Anamosa, Iowa	5,000
	Feb. 1, 1875	Webster City, Iowa	Boone River	Des Moines River	Anamosa, Iowa	9,800
	Feb. 1, 1875	Pomeroy, Iowa	Twin Lakes	North Coon River	Anamosa, Iowa	10,000
	Feb. 1, 1875	Storm Lake, Iowa	Storm Lake	North Coon River	Anamosa, Iowa	10,000
	Feb. 1, 1875	Manchester, Iowa	Maquoketa River	Mississippi River	Anamosa, Iowa	200
	Feb. 13, 1875	Tipton, Iowa	Cedar River	Iowa River	Anamosa, Iowa	4,000
	Mar. 6, 1875	Linn County, Iowa	Storm Spring	Mississippi River	Anamosa, Iowa	4,000
	Mar. 10, 1875	Decorah, Iowa	Upper Iowa River	Mississippi River	Anamosa, Iowa	8,000
	Apr. 7, 1875	Anamosa, Iowa	Wapsipinicon River	Mississippi River	Anamosa, Iowa	5,000
	Dec. 9, 1875	Plymouth County, Iowa	Deep Creek	Floyd River	Anamosa, Iowa	10,000
	Dec. 11, 1875	Chickasaw County, Iowa	Wapsie River	Mississippi River	Anamosa, Iowa	8,000
	Dec. 21, 1875	Winneshiek County, Iowa	Upper Iowa River	Mississippi River	Anamosa, Iowa	10,000
	Jan. 14, 1876	Winneshiek County, Iowa	Turkey River	Mississippi River	Anamosa, Iowa	5,000
	Jan. 14, 1876	Fayette County, Iowa	Volga River	Turkey River	Anamosa, Iowa	5,000
	Jan. 15, 1876	Marion County, Iowa	White Breast Creek	Des Moines River	Anamosa, Iowa	5,000
	Jan. 15, 1876	Union County, Iowa	Grand River	Missouri River	Anamosa, Iowa	5,000
	Jan. 15, 1876	Union County, Iowa	Twelve Mile Creek	Grand River	Anamosa, Iowa	5,000
	Jan. 15, 1876	Union County, Iowa	Platte River	Missouri River	Anamosa, Iowa	5,000
	Jan. 20, 1876	Council Bluffs, Iowa	Missouri River	Mississippi River	Anamosa, Iowa	20,000
	Jan. 21, 1876	Mills County, Iowa	Silver Creek	Nishnabotany River	Anamosa, Iowa	5,000
	Feb. 4, 1876	Buchanan County, Iowa	Buffalo Creek	Wapsipinicon River	Anamosa, Iowa	5,000
	Feb. 4, 1876	Floyd County, Iowa	Red Cedar River	Cedar River	Anamosa, Iowa	3,000
	Feb. 4, 1876	Floyd County, Iowa	Little Cedar River	Red Cedar River	Anamosa, Iowa	3,000
	Feb. 17, 1876	Mills County, Iowa	Nishnabotany River	Missouri River	Anamosa, Iowa	5,000
	Feb. 21, 1876	Plymouth County, Iowa	Clear Creek	Little Sioux River	Anamosa, Iowa	1,000
	Feb. 21, 1876	.....	Cedar Creek	Mississippi River	Anamosa, Iowa	2,500
	Feb. 21, 1876	.....	Iowa River	Cedar River	Anamosa, Iowa	2,500
	Feb. 21, 1876	Mahaska County, Iowa	Des Moines River	Mississippi River	Anamosa, Iowa	3,000
	Feb. 21, 1876	Mahaska County, Iowa	Skunk River	Mississippi River	Anamosa, Iowa	3,000
	Feb. 21, 1876	Montgomery County, Iowa	Walnut Creek	Nishnabotany River	Anamosa, Iowa	5,000
	Feb. 23, 1876	.....	Iowa River	Cedar River	Anamosa, Iowa	10,000
	Mar. 1, 1876	.....	Des Moines River	Mississippi River	Anamosa, Iowa	10,000
	Mar. 2, 1876	Crawford County, Iowa	Boyer River	Missouri River	Anamosa, Iowa	10,000
	Mar. 2, 1876	Missouri Valley, Iowa	Lakes	Boyer River	Anamosa, Iowa	10,000
	Mar. 6, 1876	Henry County, Iowa	Big Creek	Skunk River	Anamosa, Iowa	5,000
	Mar. 6, 1876	Davis County, Iowa	Fox River	Mississippi River	Anamosa, Iowa	2,500
	Mar. 6, 1876	Jefferson County, Iowa	Cedar Creek	Skunk River	Anamosa, Iowa	2,500
	Mar. 6, 1876	Lucas County, Iowa	Chariton River	Missouri River	Anamosa, Iowa	5,000
	Mar. 6, 1876	Marion County, Iowa	White Breast Creek	Des Moines River	Anamosa, Iowa	5,000
	Mar. 6, 1876	Montgomery County, Iowa	Nodaway River	Missouri River	Anamosa, Iowa	5,000
	Mar. 6, 1876	Mills County, Iowa	Nishnabotany River	Missouri River	Anamosa, Iowa	5,000
	Mar. 6, 1876	Montgomery County, Iowa	Walnut Creek	Nishnabotany River	Anamosa, Iowa	5,000

Mar. 6, 1876	Mills County, Iowa	Silver Creek	Nishnabotany River	Anamosa, Iowa	5,000
Mar. 6, 1876	Mills County, Iowa	Keg Creek	Missouri River	Anamosa, Iowa	5,000
Mar. 7, 1876		Cedar River	Mississippi River	Anamosa, Iowa	3,000
Mar. 14, 1876	Chickasaw County, Iowa	Wapsie River	Mississippi River	Anamosa, Iowa	10,000
Mar. 20, 1876	Hancock County, Iowa	Iowa River	Cedar River	Anamosa, Iowa	3,000
Mar. 20, 1876	Hancock County, Iowa	Boone River	Des Moines River	Anamosa, Iowa	3,000
Mar. 20, 1876	Kossuth County, Iowa	Des Moines River	Mississippi River	Anamosa, Iowa	3,000
Mar. 20, 1876	Plymouth County, Iowa	Big Sioux River	Missouri River	Anamosa, Iowa	3,000
Mar. 20, 1876	Plymouth County, Iowa	Floyd River	Missouri River	Anamosa, Iowa	3,000
Mar. 20, 1876	Calhoun County, Iowa	Twin Lakes	North Coon River	Anamosa, Iowa	5,000
Mar. 20, 1876	Storm Lake, Iowa	Storm Lake	North Coon River	Anamosa, Iowa	3,000
Mar. 20, 1876	Dickinson County, Iowa	Spirit Lake		Anamosa, Iowa	3,000
Mar. 20, 1876	Dickinson County, Iowa	Okoboji Lake	Little Sioux River	Anamosa, Iowa	3,000
Mar. 20, 1876	Hancock County, Iowa	Crystal Lake	Iowa River	Anamosa, Iowa	3,000
Mar. 27, 1876	Floyd County, Iowa	Shell Rock River	Cedar River	Anamosa, Iowa	3,000
Mar. 27, 1876	Butler County, Iowa	Beaver Creek	Shell Rock River	Anamosa, Iowa	5,000
Mar. 27, 1876	Butler County, Iowa	West Fork	Cedar River	Anamosa, Iowa	3,000
Mar. 29, 1876		Lyman Creek		Anamosa, Iowa	3,000
Mar. 29, 1876	Floyd County, Iowa	Little Cedar Creek	Red Cedar River	Anamosa, Iowa	3,000
Mar. 29, 1876	Hancock County, Iowa	Iowa River	Cedar River	Anamosa, Iowa	3,000
Mar. 29, 1876	Kossuth County, Iowa	Des Moines River	Mississippi River	Anamosa, Iowa	3,000
Mar. 29, 1876	Clear Lake, Iowa	Clear Lake	Shell Rock River	Anamosa, Iowa	2,500
Mar. 29, 1876	Hancock County, Iowa	Eagle Lake	Iowa River	Anamosa, Iowa	2,500
Mar. 29, 1876	Hancock County, Iowa	Crystal Lake	Iowa River	Anamosa, Iowa	2,500
Mar. 29, 1876	Winnebago County, Iowa	Twin Lakes	Shell Rock River	Anamosa, Iowa	2,500
Apr. 3, 1876		Cedar River	Mississippi River	Anamosa, Iowa	5,000
Dec. 26, 1876	Sundry places	Des Moines River	Mississippi River	Northville, Mich	25,000
Apr. 4, 1878		Iowa River	Cedar River	Anamosa, Iowa	5,000
Apr. 4, 1878		Copper Creek	Mississippi River	Anamosa, Iowa	5,000
Apr. 29, 1878	Floyd County, Iowa	Shell Rock River	Cedar River	Anamosa, Iowa	5,000
Apr. 29, 1878	Kossuth County, Iowa	Des Moines River	Mississippi River	Anamosa, Iowa	10,000
Apr. 29, 1878	Mills County, Iowa	Silver Creek	Nishnabotany River	Anamosa, Iowa	5,000
June 10, 1878	Dallas County, Iowa	Raccoon River	Mississippi River	Anamosa, Iowa	5,000
June 10, 1878	Mahaska County, Iowa	Skunk River	Mississippi River	Anamosa, Iowa	5,000
June 10, 1878	Warren County, Iowa	Badger River	North River	Anamosa, Iowa	5,000
June 10, 1878	Linn County, Iowa	Cedar River	Mississippi River	Anamosa, Iowa	5,000
June 10, 1878	Jones County, Iowa	Wapsie River	Mississippi River	Anamosa, Iowa	5,000
Jan. 27, 1879	Sioux City, Iowa	Big Sioux River	Missouri River	Anamosa, Iowa	4,000
Jan. 31, 1879	Clay County, Iowa	Mud Lake	Mississippi River	Anamosa, Iowa	10,000
Jan. 31, 1879		Skunk River	Mississippi River	Anamosa, Iowa	10,000
Jan. 31, 1879	Sac County, Iowa	Wall Lake		Anamosa, Iowa	10,000
Jan. 31, 1879		Towner's Lake	Mississippi River	Anamosa, Iowa	7,000
Jan. 31, 1879		Iowa River	Cedar River	Anamosa, Iowa	7,000
Feb. 12, 1879	Boone County, Iowa	Des Moines River	Mississippi River	Anamosa, Iowa	10,000
Feb. 12, 1879	Greene County, Iowa	East Coon River	Mississippi River	Anamosa, Iowa	10,000
Feb. 12, 1879	Guthrie County, Iowa	Middle River	Des Moines River	Anamosa, Iowa	10,000
Feb. 12, 1879	Sac County, Iowa	Wall Lake	Mississippi River	Anamosa, Iowa	20,000
Feb. 12, 1879	Ida County, Iowa	Maple River	Little Sioux River	Anamosa, Iowa	10,000
Feb. 20, 1879	Maquoketa, Iowa	Maquoketa River	Mississippi River	Anamosa, Iowa	10,000
Mar. 10, 1879	Anamosa, Iowa	Wapsie River	Mississippi River	Anamosa, Iowa	10,000
Mar. 17, 1879	Big Rock, Iowa	Wapsipinicon River	Mississippi River	Anamosa, Iowa	3,000
Mar. 20, 1879	Winneshiek County, Iowa	Turkey River	Mississippi River	Anamosa, Iowa	3,000

D.—TABLE II.—*Distribution of California salmon from* 1873 *to* 1880, *inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Estimated number of fish.
Iowa—Continued..	Mar. 22, 1879	Hancock County, Iowa	Boone River	Des Moines River	Anamosa, Iowa	10,000
	Mar. 22, 1879	Kossuth County, Iowa	Des Moines River	Mississippi River	Anamosa, Iowa	10,000
	Mar. 22, 1879	Plymouth County, Iowa	Plymouth Creek	Missouri River	Anamosa, Iowa	15,000
	Mar. 24, 1879	Lisbon, Iowa	Lisbon Creek	Red Cedar River	Anamosa, Iowa	4,000
	Mar. 28, 1879		Cedar River	Mississippi River	Anamosa, Iowa	5,000
	Apr. 1, 1879	Keokuk County, Iowa	North Skunk River	Skunk River	Anamosa, Iowa	2,500
	Apr. 1, 1879	Mahaska County, Iowa	South Skunk River	Skunk River	Anamosa, Iowa	2,500
	May 14, 1879	Kellogg, Iowa	North Skunk River	Skunk River	Anamosa, Iowa	2,500
	May 19, 1879	Southern Iowa	Streams along C. B. & Q. R. R.	Mississippi River	Anamosa, Iowa	12,000
	May 20, 1879	Independence, Iowa	Wapsipinicon River	Mississippi River	Anamosa, Iowa	4,000
	May 20, 1879	Fayette County, Iowa	Volga River	Turkey River	Anamosa, Iowa	5,000
	May 20, 1879	Fayette County, Iowa	Turkey River	Mississippi River	Anamosa, Iowa	5,000
	May 30, 1879	Franklin County, Iowa	Cedar River	Mississippi River	Anamosa, Iowa	10,000
	May 30, 1879	Franklin County, Iowa	Spring Creek	Cedar River	Anamosa, Iowa	5,000
Kansas	Oct. —, 1877	Ellsworth, Kans	Smoky Hill River	Kansas River	Ellsworth, Kans	99,000
	Dec. —, 1878	Stranger, Kans	Stranger River	Missouri River	Cedar Rapids, Iowa	2,500
	Dec. —, 1878	Independence, Kans	Verdigris River	Missouri River	Cedar Rapids, Iowa	2,500
	Dec. —, 1878	Delaware, Kans	Delaware River	Missouri River	Cedar Rapids, Iowa	3,000
	Dec. —, 1878	Centralia, Kans	Red Vermillion River	Kansas River	Cedar Rapids, Iowa	2,000
	Dec. —, 1878	Wetmore, Kans	Spring Creek	Kansas River	Cedar Rapids, Iowa	1,000
	Dec. —, 1878	Washington, Kans	Mill Creek	Big Blue River	Cedar Rapids, Iowa	1,000
	Dec. —, 1878	Frankfort, Kans	Black Vermillion River	Big Blue River	Cedar Rapids, Iowa	2,000
	Dec. —, 1878	Barrett, Kans	Clear Creek	Kansas River	Cedar Rapids, Iowa	1,000
	Dec. —, 1878	Blue Rapids, Kans	Big Blue River	Kansas River	Cedar Rapids, Iowa	5,000
	Dec. —, 1878	Waterville, Kans	Little Blue River	Big Blue River	Cedar Rapids, Iowa	2,000
	Dec. —, 1878	Concordia, Kans	Republican River	Kansas River	Cedar Rapids, Iowa	5,000
	Dec. —, 1878	Beloit, Kans	Solomon River	Kansas River	Cedar Rapids, Iowa	5,000
	Dec. —, 1878	Topeka, Kans	Soldier River	Kansas River	Cedar Rapids, Iowa	1,000
	Dec. —, 1878	Silver Lake, Kans	Silver Lake	Kansas River	Cedar Rapids, Iowa	500
	Dec. —, 1878	Wamego, Kans	Vermillion River	Kansas River	Cedar Rapids, Iowa	2,500
	Dec. —, 1878	Manhattan, Kans	Big Blue River	Kansas River	Cedar Rapids, Iowa	5,000
	Dec. —, 1878	Junction City, Kans	Republican River	Kansas River	Cedar Rapids, Iowa	3,000
	Dec. —, 1878	Chapman, Kans	Chapman's Creek	Kansas River	Cedar Rapids, Iowa	2,000
	Dec. —, 1878	Solomon City, Kans	Solomon River	Kansas River	Cedar Rapids, Iowa	2,000
	Dec. —, 1878	Salina, Kans	Saline River	Smoky Hill River	Cedar Rapids, Iowa	3,000
	Dec. —, 1878	Brookville, Kans	Spring Creek	Smoky Hill River	Cedar Rapids, Iowa	1,000
	Dec. —, 1878	Ellsworth, Kans	Smoky Hill River	Kansas River	Cedar Rapids, Iowa	5,000
	Dec. —, 1878	Hayes City, Kans	Big Creek	Smoky Hill River	Cedar Rapids, Iowa	5,000
	Dec. —, 1878	Ellis, Kans	Big Creek	Smoky Hill River	Cedar Rapids, Iowa	5,000
	Dec. —, 1878	Ottawa, Kans	Wakarusa River	Kansas River	Cedar Rapids, Iowa	2,000
	Dec. —, 1878	Reading, Kans	Osage River	Missouri River	Cedar Rapids, Iowa	2,500
	Dec. —, 1878	Emporia, Kans	Neosho River	Arkansas River	Cedar Rapids, Iowa	5,000
	Dec. —, 1878	Florence, Kans	Cottonwood River	Neosho River	Cedar Rapids, Iowa	2,000
	Dec. —, 1878	Eldorado, Kans	Walnut River	Arkansas River	Cedar Rapids, Iowa	3,000

Dec. —, 1878	Halstead, Kans	Little Arkansas River	Arkansas River	Cedar Rapids, Iowa	2,500
Dec. —, 1878	McPherson, Kans	Lake Inman	Little Arkansas River	Cedar Rapids, Iowa	2,000
Dec. —, 1878	Hutchinson, Kans	Cow Creek	Arkansas River	Cedar Rapids, Iowa	3,000
Dec. —, 1878	Great Bend, Kans	Walnut River	Arkansas River	Cedar Rapids, Iowa	3,000
Dec. —, 1878	Larned, Kans	Pawnee Creek	Arkansas River	Cedar Rapids, Iowa	5,000
Dec. —, 1879	Blue Rapids, Kans	Big Blue River	Kansas River	Cedar Rapids, Iowa	5,000
Dec. —, 1879	Waterville, Kans	Little Blue River	Big Blue River	Cedar Rapids, Iowa	2,000
Dec. —, 1879	Concordia, Kans	Republican River	Kansas River	Cedar Rapids, Iowa	5,000
Dec. —, 1879	Beloit, Kans	Solomon River	Kansas River	Cedar Rapids, Iowa	5,000
Dec. —, 1879	Topeka, Kans	Soldier River	Kansas River	Cedar Rapids, Iowa	1,000
Dec. —, 1879	Silver Lake, Kans	Silver Lake	Kansas River	Cedar Rapids, Iowa	500
Dec. —, 1879	Wamego, Kans	Vermillion River	Kansas River	Cedar Rapids, Iowa	2,500
Dec. —, 1879	Manhattan, Kans	Big Blue River	Kansas River	Cedar Rapids, Iowa	5,000
Dec. —, 1879	Junction City, Kans	Republican River	Kansas River	Cedar Rapids, Iowa	3,000
Dec. —, 1879	Chapman, Kans	Chapman's Creek	Kansas River	Cedar Rapids, Iowa	2,000
Dec. —, 1879	Solomon City, Kans	Solomon River	Kansas River	Cedar Rapids, Iowa	2,000
Dec. —, 1879	Salina, Kans	Saline River	Smoky Hill River	Cedar Rapids, Iowa	3,000
Dec. —, 1879	Brookville, Kans	Spring Creek	Smoky Hill River	Cedar Rapids, Iowa	1,000
Dec. —, 1879	Ellsworth, Kans	Smoky Hill River	Kansas River	Cedar Rapids, Iowa	5,000
Dec. —, 1879	Hayes City, Kans	Big Creek	Smoky Hill River	Cedar Rapids, Iowa	5,000
Dec. —, 1879	Ellis, Kans	Big Creek	Smoky Hill River	Cedar Rapids, Iowa	5,000
Dec. —, 1879	Ottawa, Kans	Wakarusa River	Kansas River	Cedar Rapids, Iowa	2,000
Dec. —, 1879	Reading, Kans	Osaga River	Missouri River	Cedar Rapids, Iowa	2,000
Dec. —, 1879	Emporia, Kans	Neosho River	Arkansas River	Cedar Rapids, Iowa	5,000
Dec. —, 1879	Florence, Kans	Cottonwood River	Neosho River	Cedar Rapids, Iowa	2,000
Dec. —, 1879	Eldorado, Kans	Walnut River	Arkansas River	Cedar Rapids, Iowa	3,000
Dec. —, 1879	Halstead, Kans	Little Arkansas River	Arkansas River	Cedar Rapids, Iowa	2,500
Dec. —, 1879	McPherson, Kans	Lake Inman	Little Arkansas River	Cedar Rapids, Iowa	2,000
Dec. —, 1879	Hutchinson, Kans	Cow Creek	Arkansas River	Cedar Rapids, Iowa	3,000
Dec. —, 1879	Great Bend, Kans	Walnut River	Arkansas River	Cedar Rapids, Iowa	3,000
Dec. —, 1879	Larned, Kans	Pawnee Creek	Arkansas River	Cedar Rapids, Iowa	5,000
Dec. —, 1879	Stranger, Kans	Stranger River	Missouri River	Cedar Rapids, Iowa	2,500
Dec. —, 1879	Independence, Kans	Verdigris River	Missouri River	Cedar Rapids, Iowa	2,500
Dec. —, 1879	Delaware, Kans	Delaware River	Missouri River	Cedar Rapids, Iowa	3,000
Dec. —, 1879	Centralia, Kans	Red Vermillion River	Kansas River	Cedar Rapids, Iowa	2,000
Dec. —, 1879	Wetmore, Kans	Spring Creek	Kansas River	Cedar Rapids, Iowa	1,000
Dec. —, 1879	Washington, Kans	Mill Creek	Big Blue River	Cedar Rapids, Iowa	1,000
Dec. —, 1879	Frankfort, Kans	Black Vermillion River	Big Blue River	Cedar Rapids, Iowa	2,000
Dec. —, 1879	Barrett, Kans	Clear Creek	Kansas River	Cedar Rapids, Iowa	1,000
Feb. 2, 1881	Topeka, Kans	Wakarusa River	Kansas River	Ellsworth, Kans	3,500
Feb. 2, 1881	Burlingame, Kans	Dragoon Creek	Kansas River	Ellsworth, Kans	4,000
Feb. 2, 1881	Burlingame, Kans	Lake Lyndon	Kansas River	Ellsworth, Kans	3,000
Feb. 2, 1881	Reading, Kans	Marais des Cygnes River	Missouri River	Ellsworth, Kans	3,000
Feb. 2, 1881	Emporia, Kans	Neosho River	Arkansas River	Ellsworth, Kans	15,000
Feb. 2, 1881	Florence, Kans	Cottonwood River	Neosho River	Ellsworth, Kans	15,000
Feb. 2, 1881	Clay Centre, Kans	Republican River	Kansas River	Ellsworth, Kans	5,000
Feb. 2, 1881	Clifton, Kans	Republican River	Kansas River	Ellsworth, Kans	5,000
Feb. 2, 1881	Concordia, Kans	Republican River	Kansas River	Ellsworth, Kans	5,000
Feb. 2, 1881	Valley Falls, Kans	Delevan River	Kansas River	Ellsworth, Kans	5,000
Feb. 2, 1881	Wamego, Kans	Vermillion River	Kansas River	Ellsworth, Kans	5,000
Feb. 2, 1881	Manhattan, Kans	Big Blue River	Kansas River	Ellsworth, Kans	5,000
Feb. 2, 1881	Chapman, Kans	Chapman's Creek	Smoky Hill River	Ellsworth, Kans	2,500

D.—TABLE II.—*Distribution of California salmon from 1873 to 1880, inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Estimated number of fish.
Kansas—Continued	Feb. 2, 1881	Solomon City, Kans.	Solomon River	Smoky Hill River	Ellsworth, Kans	3,000
	Feb. 2, 1881	Salina, Kans	Saline River	Smoky Hill River	Ellsworth, Kans	3,000
	Feb. 2, 1881	Ellsworth, Kans	Smoky Hill River	Kansas River	Ellsworth, Kans	3,000
	Feb. 2, 1881	Hays City, Kans	Big Creek	Smoky Hill River	Ellsworth, Kans	5,000
	Feb. 2, 1881	Ellis, Kans	Big Creek	Smoky Hill River	Ellsworth, Kans	3,000
	Feb. 2, 1881	Fort Harker, Kans.	Spring Creek	Smoky Hill River	Ellsworth, Kans	3,000
Kentucky	Jan. 0, 1876	Lexington, Ky	Kentucky River	Ohio River	Northville, Mich	25,000
	Nov. 27, 1876	Jefferson County, Ky	Floyd's Fork	Salt River	Louisville, Ky	1,500
	Dec. 7, 1876	Shelby County, Ky	Clear Creek	Salt River	Louisville, Ky	700
	Dec. 7, 1876	Shelby County, Ky	Mulberry Creek	Salt River	Louisville, Ky	700
	Dec. 7, 1876	Shelby County, Ky	Gist Creek	Salt River	Louisville, Ky	600
	Dec. 14, 1876	Hardin County, Ky	Middle Creek	Nolin Creek	Louisville, Ky	2,000
	Dec. 14, 1876	Hart County, Ky	Bumgartner's Creek	Green River	Louisville, Ky	1,000
	Dec. 20, 1876	Adair County, Ky	Russell Creek	Green River	Louisville, Ky	1,000
	Dec. 20, 1876	Boyle County, Ky	Dick's River	Kentucky River	Louisville, Ky	1,000
	Dec. 20, 1876	Garrard County, Ky	White Oak Creek	Dick's River	Louisville, Ky	1,000
	Dec. 20, 1876	Madison County, Ky	Silver Creek	Kentucky River	Louisville, Ky	500
	Dec. 20, 1876	Madison County, Ky	Otter Creek	Kentucky River	Louisville, Ky	500
	Dec. 20, 1876	Lincoln County, Ky	Hanging Fork	Dick's River	Louisville, Ky	1,000
	Dec. 20, 1876	Casey County, Ky	Green River	Ohio River	Louisville, Ky	1,000
	Dec. 20, 1876	Lincoln County, Ky	Dick's River	Kentucky River	Louisville, Ky	1,000
	Dec. 20, 1876	Mercer County, Ky	Salt River	Ohio River	Louisville, Ky	500
	Dec. 20, 1876	Mercer County, Ky	Chaplin River	Ohio River	Louisville, Ky	500
	Dec. 27, 1876	Woodford County, Ky	Dunlap's Branch	Kentucky River	Louisville, Ky	1,000
	Dec. 27, 1876	Henry County, Ky	East and West Forks	Little Kentucky River	Louisville, Ky	500
	Dec. 27, 1876	Henry County, Ky	North and East Forks	Floyd's Fork	Louisville, Ky	500
	Dec. 27, 1876	Clark County, Ky	Lulbegrud Creek	Red River	Louisville, Ky	200
	Dec. 27, 1876	Clark County, Ky	Howard's Upper Creek	Kentucky River	Louisville, Ky	200
	Dec. 27, 1876	Clark County, Ky	Howard's Lower Creek	Kentucky River	Louisville, Ky	200
	Dec. 27, 1876	Clark County, Ky	Stoner Creek	Licking River	Louisville, Ky	200
	Dec. 27, 1876	Clark County, Ky	Strode's Creek	Stoner Creek	Louisville, Ky	200
	Dec. 27, 1876	Scott County, Ky	Big Spring Branch	North Elkhorn River	Louisville, Ky	300
	Dec. 27, 1876	Scott County, Ky	Lane's Run	North Elkhorn River	Louisville, Ky	100
	Dec. 27, 1876	Scott County, Ky	Cane Run	North Elkhorn River	Louisville, Ky	100
	Dec. 27, 1876	Scott County, Ky	McConnell's Run	North Elkhorn River	Louisville, Ky	100
	Dec. 27, 1876	Scott County, Ky	Thomas' Spring Branch	North Elkhorn River	Louisville, Ky	200
	Dec. 27, 1876	Scott County, Ky	Saunder's Spring Branch	North Elkhorn River	Louisville, Ky	200
	Jan. 2, 1877	Marion County, Ky	North and East Fork	Rolling Fork	Louisville, Ky	1,000
	Jan. 2, 1877	Taylor County, Ky	Pittman Creek	Green River	Louisville, Ky	1,000
	Jan. 2, 1877	Nelson County, Ky	Rolling Fork	Salt River	Louisville, Ky	1,000
	Jan. 10, 1877	Laurel County, Ky	White Oak Branch	Little Rockcastle River	Louisville, Ky	2,000
	Jan. 10, 1877	Rockcastle County, Ky	Round Stone Creek	Rockcastle River	Louisville, Ky	2,000
	Jan. 10, 1877	Rockcastle County, Ky	Hardin Durham's Branch	Rockcastle River	Louisville, Ky	2,000
	Jan. 28, 1877	Green County, Ky	Booker's Branch	Green River	Louisville, Ky	500

Kentucky—Cont'd.	Jan. 28, 1877	Green County, Ky	Cave Spring Branch	Green River	Louisville, Ky	500
	Feb. 1, 1877	Fulton County, Ky	Small streams	Green River	Louisville, Ky	2,000
	Feb. 1, 1877	Caldwell County, Ky	Eddy Creek	Cumberland River	Louisville, Ky	500
	Feb. 1, 1877	Trigg County, Ky	Little River	Cumberland River	Louisville, Ky	500
	Feb. 1, 1877	Crittenden County, Ky	Hurricane Creek	Ohio River	Louisville, Ky	500
	Feb. 3, 1877	Bullitt County, Ky	Knob Creek	Salt River	Louisville, Ky	1,000
	Feb. 7, 1877	Montgomery County, Ky	Spencer Creek	Licking River	Louisville, Ky	1,000
	Feb. 7, 1877	Montgomery County, Ky	Big Slate Creek	Licking River	Louisville, Ky	2,000
	Feb. 7, 1877	Montgomery County, Ky	Little Hinkston Creek	Licking River	Louisville, Ky	1,000
	Feb. 7, 1877	Woodford County, Ky	South Elkhorn	Kentucky River	Louisville, Ky	1,000
	Feb. 7, 1877	Franklin County, Ky	Kentucky River	Ohio River	Louisville, Ky	200
	Feb. 10, 1877	Jefferson County, Ky	Lunatic Asylum Pond		Louisville, Ky	25
	Feb. 13, 1877	Warren County, Ky	Barren River	Green River	Louisville, Ky	8,000
	Nov. 30, 1877	Gallatin County, Ky	Eagle Creek	Kentucky River	Louisville, Ky	5,000
	Dec. 14, 1877	Meade County, Ky	Doe Run	Ohio River	Louisville, Ky	5,000
	Dec. 21, 1877	Hardin County, Ky	Rough Creek	Green River	Louisville, Ky	5,000
	Dec. 21, 1877	Hardin County, Ky	Nolin Creek	Green River	Louisville, Ky	5,000
	Dec. 29, 1877	Hopkins County, Ky	Drake's Creek	Green River	Louisville, Ky	17,500
	Jan. 3, 1878	Warren County, Ky	Jasper River	Green River	Louisville, Ky	2,000
	Jan. 3, 1878	Warren County, Ky	Barren River	Green River	Louisville, Ky	12,000
	Jan. 12, 1878	Woodford County, Ky	Pond	Kentucky River	Louisville, Ky	500
	Jan. 12, 1878	Woodford County, Ky	Pond	Kentucky River	Louisville, Ky	1,500
	Jan. 12, 1878	Bourbon County, Ky	Elmwood Creek	Ohio River	Louisville, Ky	2,000
	Jan. 12, 1878	Jessamine County, Ky	Hickman Creek	Kentucky River	Louisville, Ky	2,000
	Jan. 12, 1878	Jessamine County, Ky	Jessamine Creek	Kentucky River	Louisville, Ky	2,000
	Jan. 12, 1878	Franklin County, Ky	Pond	Kentucky River	Louisville, Ky	200
	Jan. 12, 1878	Franklin County, Ky	Pond	Kentucky River	Louisville, Ky	800
	Jan. 28, 1878	Christian County, Ky	Little River	Cumberland River	Louisville, Ky	4,000
	Feb. 1, 1878	Caldwell County, Ky	Eddy Creek	Cumberland River	Louisville, Ky	3,000
	Feb. 13, 1878	Carter County, Ky	Tygert River	Big Sandy River	Louisville, Ky	2,000
	Feb. 13, 1878	Carter County, Ky	Little Sandy River	Ohio River	Louisville, Ky	2,000
Louisiana	Jan. 1, 1875		Tangipahoa River	Lake Pontchartrain	Pokagon, Mich	15,000
	Dec. 22, 1876	Tickfaw, La	Notalbany River	Lake Maurepas	Northville, Mich	14,200
	Dec. 22, 1876	Amite City, La	Tangipahoa River	Lake Pontchartrain	Northville, Mich	14,200
Maine	Feb. —, 1874	Bucksport, Me	Craig's Pond	Penobscot River	Bucksport, Me	4,900
	Feb. —, 1874	Bucksport, Me	Hatching-House Pond	Penobscot River	Bucksport, Me	100
	Spring, 1875	Bucksport, Me	Craig's Pond	Penobscot River	Bucksport, Me	30,000
	Feb. 6, 1879	Keen's Lake, Me	Keen's Lake Stream	Saint Croix River	Pembroke, Me	9,700
	Feb. 13, 1879	Pembroke, Me	Pennaquan River	Bay of Fundy	Pembroke, Me	3,000
Maryland	Nov. 25, 1874	Hagerstown, Md	Antietam Creek	Potomac River	Green Springs, Md	3,000
	Nov. 25, 1874	Wakefield, Md	Pipe Creek	Monocacy River	Green Springs, Md	1,500
	Nov. 25, 1874	Union Bridge, Md	Pipe Creek	Monocacy River	Green Springs, Md	1,000
	Nov. 25, 1874	Slabtown, Md	Owen's Creek	Monocacy River	Green Springs, Md	1,500
	Nov. 30, 1874	Freeland, Md	Gunpowder River	Gunpowder River	Green Springs, Md	10,000
	Nov. 30, 1874	Tank, Md	North Patapsco River	Patapsco River	Green Springs, Md	6,000
	Dec. 1, 1874			Chesapeake Bay	Green Springs, Md	6,000
	Dec. 2, 1874	Mechanicstown, Md	Owen's Creek	Monocacy River	Green Springs, Md	6,000
	Dec. 2, 1874	Hagerstown, Md	Conococheague River	Potomac River	Green Springs, Md	10,000
	Dec. 2, 1874	Tannery, Md	Evitts Creek	Potomac River	Green Springs, Md	5,000
	Dec. 2, 1874	Jennings Run, Md	Wills Creek	Potomac River	Green Springs, Md	5,000
	Dec. 3, 1874	Franklinville, Md	Savage Creek	Potomac River	Green Springs, Md	15,000
	Dec. 5, 1874	Liberty Grove, Md	Octorora Creek	Susquehanna River	Green Springs, Md	10,000

D.—TABLE II.—*Distribution of California salmon from* 1873 *to* 1880, *inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Estimated number of fish.
Maryland—Cont'd.	Dec. 5, 1874	Monrovia, Md	Bush Creek	Monocacy River	Green Springs, Md	4,000
	Dec. 5, 1874	Hood's Mills, Md	Patapsco River	Chesapeake Bay	Green Springs, Md	6,000
	Dec. 9, 1874	Howard County, Md	Patuxent River	Chesapeake Bay	Green Springs, Md	8,000
	Dec. 9, 1874	Fort Pendleton, Md	North Branch	Potomac River	Green Springs, Md	15,000
	Dec. 15, 1874	Savage, Md	Patuxent River	Chesapeake Bay	Green Springs, Md	10,000
	Dec. 15, 1874	Maryland Line, Md	Deer Creek	Susquehanna River	Green Springs, Md	6,000
	Dec. 15, 1875	Savage, Md	Little Patuxent River	Patuxent River	Baltimore, Md	7,000
	Dec. 15, 1875	Patuxent, Md	Little Patuxent River	Patuxent River	Baltimore, Md	7,000
	Dec. 15, 1875	Laurel, Md	Patuxent River	Chesapeake Bay	Baltimore, Md	14,000
	Dec. 21, 1875	Point of Rocks, Md	Potomac River	Chesapeake Bay	Baltimore, Md	45,000
	Jan. 3, 1876	Savage, Md	Little Patuxent River	Patuxent River	Baltimore, Md	14,500
	Jan. 5, 1876	Tank, Md	North Patapsco River	Patapsco River	Baltimore, Md	10,000
	Jan. 5, 1876	Slabtown, Md	Owen's Creek	Monocacy River	Baltimore, Md	13,000
	Jan. 5, 1876	Baltimore, Md	Baltimore Water Works	Patapsco River	Baltimore, Md	5,000
	Jan. 7, 1876	Gleneoe, Md	Gunpowder River	Chesapeake Bay	Baltimore, Md	18,000
	Jan. 14, 1876	Phœnix, Md	Gunpowder River	Chesapeake Bay	Baltimore, Md	30,000
	Jan. 24, 1876	Baltimore, Md	Baltimore Water Works	Patapsco River	Baltimore, Md	500
	Jan. 26, 1876	Weyerton, Md	Potomac River	Chesapeake Bay	Baltimore, Md	5,000
	Feb. 10, 1876	Cedar Point, Md	Patuxent River	Chesapeake Bay	Baltimore, Md	164
	Mar. 16, 1876	Aberdeen, Md	Tobacco Run	Deer Creek	Baltimore, Md	15,000
	Mar. 16, 1876	Aberdeen, Md	Archer's Run	Deer Creek	Baltimore, Md	500
	Mar. 16, 1866	Aberdeen, Md	Green Spring Run	Deer Creek	Baltimore, Md	500
	Mar. 19, 1876	Savage, Md	Little Patuxent River	Patuxent River	Baltimore, Md	6,000
	Mar. 21, 1876	Savage, Md	Little Patuxent River	Patuxent River	Baltimore, Md	13,000
	Mar. 23, 1876	Hagerstown, Md	Antietam Creek	Potomac River	Baltimore, Md	4,000
	Mar. 23, 1876	Tank, Md	North Patapsco River	Patapsco River	Baltimore, Md	2,000
	Mar. 23, 1876	Slabtown, Md	Owen's Creek	Monocacy River	Baltimore, Md	3,000
	Mar. 23, 1876	Double Pipe Creek, Md	Double Pipe Creek	Monocacy River	Baltimore, Md	2,000
	Mar. 25, 1876	Laurel, Md	Patuxent River	Chesapeake Bay	Baltimore, Md	6,000
	Mar. 29, 1876	Fort Pendleton, Md	North Branch	Potomac River	Baltimore, Md	12,000
	Apr. 3, 1876	Monkton, Md	Little Gunpowder River	Gunpowder River	Baltimore, Md	7,000
	Apr. 6, 1876	Ellicott City, Md	North Branch	Patuxent River	Baltimore, Md	3,200
	Apr. 7, 1876	Magnolia, Md	Winter's Run	Bush River	Baltimore, Md	1,000
	Apr. 14, 1876	Westminster, Md	Pipe Creek	Monocacy River	Baltimore, Md	2,000
	Apr. 17, 1876	Rowlandville, Md	Octorora Creek	Susquehanna River	Baltimore, Md	1,900
	Apr. 17, 1876	Williamsport, Md	Conococheague River	Potomac River	Baltimore, Md	2,000
	Nov. 6, 1876	Parkton, Md	Gunpowder River	Chesapeake Bay	Baltimore, Md	30,000
	Nov. 8, 1876	Tank, Md	North Patapsco River	Patapsco River	Baltimore, Md	10,000
	Nov. 8, 1876	Wakefield, Md	Pipe Creek	Monocacy River	Baltimore, Md	15,000
	Nov. 8, 1876	Mechanicstown, Md	Owen's Creek	Potomac River	Baltimore, Md	25,000
	Nov. 10, 1876	Pennsylvania Line, Md	Deer Creek	Susquehanna River	Baltimore, Md	30,000
	Nov. 14, 1876	Savage, Md	Patuxent River	Chesapeake Bay	Baltimore, Md	43,000
	Nov. 14, 1876	Sykesville, Md	Patapsco River	Chesapeake Bay	Baltimore, Md	48,000
	Nov. 21, 1876	Monkton, Md	Little Gunpowder River	Gunpowder River	Baltimore, Md	33,800

Nov. 21, 1876	Mount Airy, Md	North Patuxent River	Patuxent River	Baltimore, Md	46,400
Nov. 22, 1876	Tank, Md	North Patapsco River	Patapsco River	Baltimore, Md	10,400
Nov. 22, 1876	Hagerstown, Md	Conococheague River	Potomac River	Baltimore, Md	34,240
Nov. 22, 1876	Chewsville, Md	Antietam Creek	Potomac River	Baltimore, Md	29,400
Nov. 24, 1876	Bohemia Bridge, Md	Bohemia Creek	Elk River	Baltimore, Md	12,800
Nov. 24, 1876	Frederick, Md	Sassafras River	Chesapeake Bay	Baltimore, Md	22,640
Nov. 27, 1876	Fort Pendleton, Md	North Branch	Potomac River	Baltimore, Md	75,780
Dec. 1, 1876	Laurel, Md	Patuxent River	Chesapeake Bay	Baltimore, Md	24,000
Dec. 1, 1876	Cockeysville, Md	Western River	Gunpowder River	Baltimore, Md	24,000
Dec. 6, 1876	Federalsburgh, Md	Marsh Hope Creek	Nanticoke River	Baltimore, Md	9,600
Dec. 6, 1876	Greensborough, Md	Choptank River	Chesapeake Bay	Baltimore, Md	10,400
Dec. 6, 1876	Hillsborough, Md	Tuckahoe Creek	Choptank River	Baltimore, Md	9,600
Dec. 8, 1876	Cristield, Md	Cristield Harbor	Tangier Sound	Baltimore, Md	8,000
Dec. 8, 1876	Newtown, Md	Pocomoke River	Pocomoke Sound	Baltimore, Md	24,000
Dec. 8, 1876	Point of Rocks, Md	Potomac River	Chesapeake Bay	Baltimore, Md	56,800
Dec. 11, 1876	Elkton, Md	Elk River	Chesapeake Bay	Baltimore, Md	20,000
Dec. 11, 1876	Millington, Md	Chester River	Chesapeake Bay	Baltimore, Md	20,000
Dec. 15, 1876	Fort Pendleton, Md	North Branch	Potomac River	Baltimore, Md	75,780
Dec. 28, 1876	Oakland, Md	Youghiogheny River	Monongahela River	Baltimore, Md	9,900
Jan. 30, 1877	Monkton, Md	Gunpowder River	Chesapeake Bay	Baltimore, Md	4,000
Jan. 30, 1877	Monkton, Md	Little Gunpowder River	Gunpowder River	Baltimore, Md	10,000
Mar. 19, 1877	Harford County, Md	Winter's Run	Bush River	Baltimore, Md	800
Apr. 11, 1877	Harford County, Md	Private pond	Bush River	Baltimore, Md	50
May 8, 1877	Deer Park, Md	Youghiogheny River	Monongahela River	Baltimore, Md	2,000
May 31, 1877		Private ponds		Baltimore, Md	150
Nov. 19, 1877	Fort Pendleton, Md	Potomac River	Chesapeake Bay	Baltimore, Md	29,000
Nov. 22, 1877	Swanton, Md	Savage River	Potomac River	Baltimore, Md	12,000
Dec. 7, 1877	Phœnix, Md	Gunpowder River	Chesapeake Bay	Baltimore, Md	20,000
Dec. 10, 1877	Tank, Md	Patuxent River	Chesapeake Bay	Baltimore, Md	8,000
Mar. 4, 1878	Weverton, Md	Pond	Potomac River	Baltimore, Md	600
Mar. 7, 1878	Spencerville, Md	Patuxent River	Chesapeake Bay	Baltimore, Md	500
Mar. 11, 1878	Laurel, Md	Patuxent River	Chesapeake Bay	Baltimore, Md	10,000
Mar. 12, 1878	Parkton, Md	Gunpowder River	Chesapeake Bay	Baltimore, Md	10,000
Mar. 16, 1878	Hood's Mills, Md	Patapsco River	Chesapeake Bay	Baltimore, Md	10,000
Mar. 18, 1878	Savage, Md	Patuxent River	Chesapeake Bay	Baltimore, Md	12,000
Mar. 21, 1878	Weverton, Md	Potomac River	Chesapeake Bay	Baltimore, Md	12,000
Mar. 22, 1878		Pond	Bear Creek	Baltimore, Md	1,000
Mar. 25, 1878	Laurel, Md	Patuxent River	Chesapeake Bay	Baltimore, Md	8,000
Apr. 1, 1878	Tank, Md	Patapsco River	Chesapeake Bay	Baltimore, Md	5,000
Apr. 1, 1878	Double Pipe Creek, Md	Patapsco River	Chesapeake Bay	Baltimore, Md	7,000
Apr. 1, 1878	Hood's Mills, Md	Patapsco River	Chesapeake Bay	Baltimore, Md	6,000
Apr. 3, 1878	Weverton, Md	Potomac River	Chesapeake Bay	Baltimore, Md	35,000
Nov. 6, 1878	Cockeysville, Md	Gunpowder River	Chesapeake Bay	Baltimore, Md	28,000
Nov. 7, 1878	Laurel, Md	Patuxent River	Chesapeake Bay	Baltimore, Md	24,000
Nov. 7, 1878	Savage, Md	Little Patuxent River	Patuxent River	Baltimore, Md	18,000
Nov. 8, 1878	Scintman's Mills, Cecil County, Md.	Big Elk River	Chesapeake Bay	Baltimore, Md	7,500
Nov. 8, 1878	Rock Church, Cecil County, Md.	Little Elk River	Chesapeake Bay	Baltimore, Md	7,500
Nov. 9, 1878	North East, Md	North East Creek	North East River	Baltimore, Md	15,000
Nov. 9, 1878	Tank, Md	Patapsco River	Chesapeake Bay	Baltimore, Md	10,000
Nov. 9, 1878	New Windsor, Md	Pipe Creek	Monocacy River	Baltimore, Md	13,000

D.—TABLE II.—*Distribution of California salmon from* 1873 *to* 1880, *inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Estimated number of fish.
Maryland—Cont'd.	Nov. 9, 1878	Mechanicstown, Md	Owen's Creek	Patapsco River	Baltimore, Md	13,000
	Nov. 11, 1878	Laurel, Md	Patuxent River	Chesapeake Bay	Baltimore, Md	25,000
	Nov. 11, 1878	Savage, Md	Little Patuxent River	Patuxent River	Baltimore, Md	12,500
	Nov. 12, 1878	Millington, Md	Chester River	Chesapeake Bay	Baltimore, Md	15,000
	Nov. 13, 1878	Hillsborough, Md	Tuckahoe Creek	Choptank River	Baltimore, Md	5,500
	Nov. 13, 1878	Sykesville, Md	Patapsco Creek	Chesapeake Bay	Baltimore, Md	15,000
	Nov. 27, 1878	Monkton, Md	Gunpowder River	Chesapeake Bay	Baltimore, Md	20,000
	Nov. 28, 1878	Monkton, Md	Gunpowder River	Chesapeake Bay	Baltimore, Md	20,000
	Nov. 29, 1878	Fort Pendleton, Md	North Branch	Potomac River	Baltimore, Md	20,000
	Nov. 30, 1878	Fort Pendleton, Md	North Branch	Potomac River	Baltimore, Md	20,000
	Dec. 1, 1878	Fort Pendleton, Md	North Branch	Potomac River	Baltimore, Md	24,500
	Dec. 2, 1878	Swanton, Md	North Branch	Potomac River	Baltimore, Md	20,000
	Dec. 4, 1878	Henderson, Md	Choptank River	Chesapeake Bay	Baltimore, Md	20,000
	Dec. 6, 1878	Boyds, Md	Ten Mile Creek		Baltimore, Md	6,000
	Dec. 6, 1878	Boyds, Md	Lonem Creek	Potomac River	Baltimore, Md	8,000
	Dec. 6, 1878	Boyds, Md	Brick Lodge Creek		Baltimore, Md	6,000
	Dec. 7, 1878		Monocacy River	Chesapeake Bay	Baltimore, Md	20,000
	Dec. 9, 1878	Hillsborough, Md	Nanticoke River	Chesapeake Bay	Baltimore, Md	10,000
	Dec. 12, 1878	Mitchell's Bridge, Md	Pocomoke River	Chesapeake Bay	Baltimore, Md	12,000
	Dec. 12, 1878	Above Snow Hill, Md	Pocomoke River	Chesapeake Bay	Baltimore, Md	8,000
	Dec. 12, 1878	Townson, Md	Gunpowder River	Chesapeake Bay	Baltimore, Md	20,000
	Dec. 13, 1878	Mount Airy, Md	Patuxent River	Chesapeake Bay	Baltimore, Md	20,000
	Dec. 14, 2878	Herring Run, Md	Back River	Chesapeake Bay	Baltimore, Md	10,000
	Dec. 17, 1878	Millington, Md	Chester River	Chesapeake Bay	Baltimore, Md	1,200
	Dec. 17, 1878	Middletown, Md	Great Gunpowder River	Chesapeake Bay	Baltimore, Md	1,000
	Dec. 19, 1878	Liberty Grove, Md	Octorora Creek	Susquehanna River	Baltimore, Md	10,000
	Dec. 21, 1878	Parkton, Md	Deer Creek	Susquehanna River	Baltimore, Md	20,000
	Feb. 1, 1879	Wilna, Md	Winter's Run	Bush River	Baltimore, Md	4,000
	Feb. 1, 1879	Savage, Md	Patuxent River	Chesapeake Bay	Baltimore, Md	10,000
	Feb. 13, 1879	Millington, Md	Chester River	Chesapeake Bay	Baltimore, Md	12,000
	Feb. 21, 1879	Henderson, Md	Choptank River	Chesapeake Bay	Baltimore, Md	8,000
	Feb. 24, 1879	Henderson, Md	Choptank River	Chesapeake Bay	Baltimore, Md	7,000
	Feb. 26, 1879	Cambridge, Md	Blackwater River	Tangier Sound	Baltimore, Md	3,000
	Feb. 26, 1879	Dorchester County, Md	Chicamico River	Transquaking River	Baltimore, Md	3,000
	Feb. 26, 1879	Airey's, Md	Transquaking River	Tangier Sound	Baltimore, Md	3,000
	Feb. 28, 1879	Hood's Mills, Md	Patapsco River	Chesapeake Bay	Baltimore, Md	12,000
	June 6, 1879	Airey's, Md	Patuxent River	Chesapeake Bay	Baltimore, Md	236
	Oct. 30, 1879	Fort Pendleton, Md	Potomac River		Baltimore, Md	125,000
	Nov. 26, 1879		North Branch	Potomac River	Baltimore, Md	187,276
	Nov. 26, 1879	Parkton, Md	Big Gunpowder River	Chesapeake Bay	Baltimore, Md	15,000
	Nov. 29, 1879	Parkton, Md	Deer Creek	Susquehanna River	Baltimore, Md	15,000
	Dec. 4, 1879	Laurel, Md	Patuxent River	Chesapeake Bay	Baltimore, Md	20,000
	Dec. 4, 1879	Savage, Md	Middle Patuxent River	Patuxent River	Baltimore, Md	20,000
	Dec. 5, 1879	Federalsburgh, Md	Nanticoke River	Chesapeake Bay	Baltimore, Md	5,000

	Dec. 5, 1879	Linkwood, Md	Transquaking River	Tangier Sound	Baltimore, Md	1,000
	Dec. 5, 1879	Flemings Mills, Md	Chicacomico River	Transquaking River	Baltimore, Md	1,500
	Dec. 5, 1879	Barn's Farm, Md	Blackwater River	Tangier Sound	Baltimore, Md	1,500
	Dec. 9, 1879	De Graw's, Md	Octorora River	Chesapeake Bay	Baltimore, Md	6,000
	Dec. 9, 1879	Hereford Md	East River	Chesapeake Bay	Baltimore, Md	5,000
	Dec. 10, 1879	Saint Marks, Md	Big Elk River	Chesapeake Bay	Baltimore, Md	6,000
	Dec. 10, 1879	Millington, Md	Andover Branch	Chester River	Baltimore, Md	5,000
	Dec. 11, 1879	Hood's Mills, Md	Patapsco River	Chesapeake Bay	Baltimore, Md	10,000
	Dec. 11, 1879	Mount Airoy, Md	Little Patuxent River	Chesapeake Bay	Baltimore, Md	10,000
	Dec. 12, 1879	Salisbury, Md	Humphrey's Lake	Wicomico Creek	Baltimore, Md	1,000
	Dec. 12, 1879	Salisbury, Md	Wicomico Creek	Wicomico River	Baltimore, Md	4,000
	Dec. 12, 1879	Whaleysville, Md	Pocomoke River	Chesapeake Bay	Baltimore, Md	2,000
	Dec. 12, 1879	Berlin, Md	Trappe River	Choptank River	Baltimore, Md	2,000
	Dec. 12, 1879	Berlin, Md	Herring Creek	Atlantic Ocean	Baltimore, Md	2,000
	Dec. 13, 1879	Hagerstown, Md	Antietam River	Potomac River	Baltimore, Md	10,000
	Dec. 13, 1879	Hagerstown, Md	Conococheague River	Potomac River	Baltimore, Md	20,000
	Dec. 15, 1879	Middleburgh, Md	Big Pipe Creek	Monocacy River	Baltimore, Md	10,000
	Dec. 15, 1879	Mechanicstown, Md	Owen's Creek	Monocacy River	Baltimore, Md	10,000
	Dec. 15, 1879	Tank, Md	North Patapsco River	Patapsco River	Baltimore, Md	5,000
	Dec. 16, 1879	Parkton, Md	Deer Creek	Susquehanna River	Baltimore, Md	10,000
	Dec. 16, 1879	Sandy Branch, Md	Sassafras River	Chesapeake Bay	Baltimore, Md	1,000
	Dec. 16, 1879	Cecil County, Md	Bohemia River	Elk River	Baltimore, Md	1,000
	Dec. 16, 1879	Carter's Bridge, Md	Great Choptank River	Chesapeake Bay	Baltimore, Md	6,000
	Dec. 17, 1879	Cockeysville, Md	Gunpowder River	Chesapeake Bay	Baltimore, Md	10,000
	Dec. 18, 1879	Laurel, Md	Patuxent River	Chesapeake Bay	Baltimore, Md	10,000
	Dec. 18, 1879	Savage, Md	Middle Patuxent River	Patuxent River	Baltimore, Md	10,000
	Dec. 23, 1879	Towson, Md	Gunpowder River	Chesapeake Bay	Baltimore, Md	10,000
	Mar. 9, 1880	Sandy Spring, Md	Pond	Patuxent River	Baltimore, Md	1,000
	Mar. 25, 1880	Buckeystown, Md	Pond	Monocacy River	Baltimore, Md	800
	Nov. 12, 1880	De Graw's, Md	Octorora River	Susquehanna River	Baltimore, Md	12,000
	Nov. 13, 1880		North East Creek	North East River	Baltimore, Md	6,000
	Nov. 13, 1880	Scintman's Mill, Md	Big Elk River	Chesapeake Bay	Baltimore, Md	6,000
	Nov. 15, 1880	Millington, Md	Chester River	Chesapeake Bay	Baltimore, Md	18,000
	Nov. 17, 1880	Henderson, Md	Choptank River	Chesapeake Bay	Baltimore, Md	18,000
	Nov. 19, 1880	Salisbury, Md	Wicomico River	Chesapeake Bay	Baltimore, Md	9,000
	Nov. 19, 1880	Whaleysville, Md	Pocomoke River	Chesapeake Bay	Baltimore, Md	9,000
	Nov. 22, 1880	Fort Pendleton, Md	Pocomoke River	Potomac River	Baltimore, Md	72,396
	Nov. 23, 1880	Salisbury, Md	Wicomico River	Chesapeake Bay	Baltimore, Md	9,000
	Nov. 23, 1880	Berlin, Md	Trappe River	Synapuxet River	Baltimore, Md	9,000
	Nov. 26, 1880	Federalsburgh, Md	Nanticoke River	Chesapeake Bay	Baltimore, Md	6,000
	Nov. 29, 1880	Cecil County, Md	Bohemia River	Elk River	Baltimore, Md	5,000
	Nov. 29, 1880	Cecil County, Md	Sassafras River	Chesapeake Bay	Baltimore, Md	5,000
	Dec. 1, 1880	Harris Dam, Md	Octorora River	Susquehanna River	Baltimore, Md	16,500
	Dec. 1, 1880	North East, Md	Sharon's Run	Susquehanna River	Baltimore, Md	1,500
	Dec. 3, 1880	Federalsburg, Md	Nanticoke River	Chesapeake Bay	Baltimore, Md	5,000
	Dec. 16, 1880	Phœnix, Md	Gunpowder River	Chesapeake Bay	Baltimore, Md	5,013
	Dec. 17, 1880	Savage, Md	Patuxent River	Chesapeake Bay	Baltimore, Md	5,014
Massachusetts	Fall of 1873	Winchester, Mass	Mystic River	Boston Bay	Winchester, Mass	20,000
	Fall of 1873		Red Brook		Winchester, Mass	7,000
	Fall of 1874	Winchester, Mass	Mystic River	Boston Bay	Winchester, Mass	7,000
	Spring, 1876	Plymouth County, Mass	North River	Massachusetts Bay	Winchester, Mass	25,000
	Fall of 1876	Saugus, Mass	Saugus River	Broad Sound	Winchester, Mass	10,000

D.—TABLE II.—*Distribution of California salmon from 1873 to 1880, inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Estimated number of fish.
Massachusetts—Continued.	Fall of 1876	Marshfield, Mass	North River	Massachusetts Bay	Winchester, Mass	30,000
	Fall of 1876	Lancaster, Mass	Nashua River	Merrimac River	Winchester, Mass	50,000
	Dec. —, 1877	Essex County, Mass	Ipswich River	Atlantic Ocean	Winchester, Mass	7,000
	Dec. —, 1877	Worcester County, Mass	Nashua River	Merrimac River	Winchester, Mass	30,000
	Dec. —, 1877	Marshfield, Mass	North River	Massachusetts Bay	Winchester, Mass	25,000
	Dec. —, 1877	Saugus, Mass	Saugus River	Broad Sound	Winchester, Mass	7,000
	Dec. —, 1877	Bridgewater, Mass	Winnetuxet River	Taunton River	Winchester, Mass	10,000
Michigan	Dec. 25, 1873	Hillsdale County, Mich	Butternut Creek	Saint Joseph River	Jackson, Mich	6,000
	Dec. 25, 1873	Hillsdale County, Mich	Sand Creek	Saint Joseph River	Jackson, Mich	9,000
	Dec. 25, 1873	Pokagon, Mich	State Hatchery Pond	Saint Joseph River	Jackson, Mich	700
	Dec. 27, 1873	Kalamazoo County, Mich	Gull Creek	Kalamazoo River	Jackson, Mich	3,000
	Dec. 27, 1873	Ross Township, Mich	Lake	Kalamazoo River	Jackson, Mich	200
	Dec. 29, 1873	Jackson, Mich	East Branch	Kalamazoo River	Jackson, Mich	15,000
	Dec. 30, 1873	Jackson County, Mich		Grand River	Jackson, Mich	12,000
	Jan. 1, 1874		Sandstone Creek	Grand River	Jackson, Mich	8,000
	Jan. 2, 1874	Grand Rapids, Mich	Perkins and Hess Pond	Grand River	Jackson, Mich	100
	Jan. 2, 1874		Sandstone Creek	Grand River	Jackson, Mich	8,000
	Jan. 3, 1874		Sandstone Creek	Grand River	Jackson, Mich	8,000
	Jan. 3, 1874	Grand Rapids, Mich	Perkins and Hess Pond	Grand River	Jackson, Mich	100
	Jan. 6, 1874	Jackson, Mich	Cronch's Creek	Grand River	Jackson, Mich	4,000
	Jan. 6, 1874	Jackson County, Mich	Cronch's Creek	Grand River	Jackson, Mich	2,000
	May 8, 1874	Kalamazoo, Mich	Lunatic Asylum Pond	Kalamazoo River	Jackson, Mich	130
	Dec. 18, 1874		William's Creek	Dowagiac Creek	Pokagon, Mich	5,000
	Dec. 18, 1874		Emmon's Creek	Dowagiac Creek	Pokagon, Mich	5,000
	Dec. 18, 1874	Reed City, Mich	Hersey Creek	Muskegon River	Pokagon, Mich	50,000
	Dec. 22, 1874		Cullom's Creek	Dowagiac Creek	Pokagon, Mich	10,000
	Dec. 23, 1874	Crawford County, Mich	Au Sable River	Lake Huron	Pokagon, Mich	50,000
	Dec. 23, 1874	Calhoun County, Mich	Metcalf's Lake	Lake Michigan	Pokagon, Mich	7,000
	Dec. 26, 1874	Kalamazoo, Mich	Spring Brook Creek	Kalamazoo River	Pokagon, Mich	40,000
	Dec. 30, 1874	Negaunee, Mich	Carp River	Lake Superior	Pokagon, Mich	60,000
	Jan. 14, 1875	Cass County, Mich	Burke's Creek	Dowagiac Creek	Pokagon, Mich	3,000
	Jan. 15, 1875		Crystal Springs Creek	Dowagiac Creek	Pokagon, Mich	6,000
	Jan. 15, 1875		Meadowhill Creek	Dowagiac Creek	Pokagon, Mich	4,000
	Jan. 16, 1875		Pokagon Creek	Dowagiac Creek	Pokagon, Mich	7,000
	Jan. 16, 1875	Owosso, Mich	Shiawassee River	Saginaw River	Pokagon, Mich	35,000
	Jan. 16, 1875	Battle Creek, Mich	Gongeac Lake	Kalamazoo River	Pokagon, Mich	3,000
	Feb. 27, 1875	Saint Joseph, Mich	Ponds	Lake Michigan	Pokagon, Mich	500
	Mar. 22, 1875	Monroe, Mich	River Raisin	Lake Erie	Pokagon, Mich	10,000
	Mar. 30, 1875	Oakland County, Mich	Lake Orion	Great Lakes	Pokagon, Mich	10,000
	April 1, 1875	Pokagon, Mich	Ponds	Saint Joseph River	Pokagon, Mich	1,000
	July 3, 1875	Kalamazoo, Mich	Baptist Seminary Pond		Pokagon, Mich	100
	Dec. 8, 1875	Cass County, Mich	Indian Creek	Dowagiac River	Pokagon, Mich	15,000
	Dec. 8, 1875	Cass County, Mich	William's Creek	Dowagiac River	Pokagon, Mich	8,000
	Dec. 8, 1875	Cass County, Mich	Peavine Creek	Dowagiac River	Pokagon, Mich	15,000

Dec. 8, 1875	Pokagon, Mich	Pokagon Creek	Dowagiac River	Pokagon, Mich	10,000
Dec. 11, 1875	Niles, Mich	Saint Joseph River	Lake Michigan	Pokagon, Mich	33,000
Dec. 15, 1875	Otsego Lake, Mich	Otsego Lake	Au Sable River	Northville, Mich	20,000
Dec. 16, 1875	Kalamazoo County, Mich	Twin Lakes	Au Sable River	Pokagon, Mich	4,000
Dec. 16, 1875	Kalamazoo County, Mich	Putty Lake	Au Sable River	Pokagon, Mich	2,000
Dec. 16, 1875	Kalamazoo County, Mich	Indian Lake	Saint Joseph River	Pokagon, Mich	2,000
Dec. 16, 1875	Kalamazoo County, Mich	Portage River	Saint Joseph River	Pokagon, Mich	4,000
Dec. 16, 1875	Barry County, Mich	Long Lake	Grand River	Pokagon, Mich	2,000
Dec. 16, 1875	Kalamazoo County, Mich	Lyon's Lake	Lake Michigan	Pokagon, Mich	2,000
Dec. 16, 1875	Kalamazoo County, Mich	Wood's Lake	Lake Michigan	Pokagon, Mich	4,000
Dec. 16, 1875	Kalamazoo County, Mich	McMartin's Lake	Lake Michigan	Pokagon, Mich	4,000
Dec. 16, 1875	Kalamazoo County, Mich	Lewis Lake	Lake Michigan	Pokagon, Mich	2,000
Dec. 16, 1875	Calhoun County, Mich	Metcalf Lake	Lake Michigan	Pokagon, Mich	2,000
Dec. 16, 1875	Calhoun County, Mich	Bruce Lake	Lake Michigan	Pokagon, Mich	4,000
Dec. 16, 1875	Kalamazoo County, Mich	Gull Lake	Kalamazoo River	Pokagon, Mich	4,000
Dec. 16, 1875	Calhoun County, Mich	Goguac Lake	Kalamazoo River	Pokagon, Mich	4,000
Dec. 20, 1875	Paw Paw, Mich	Paw Paw River	Lake Michigan	Pokagon, Mich	16,000
Dec. 21, 1875	Flint County, Mich	Flint River	Saginaw River	Northville, Mich	10,000
Dec. 21, 1875	Bay County, Mich	Rifle River	Saginaw Bay	Northville, Mich	8,000
Dec. 22, 1875	Midland, Mich	Tittabawassee River	Saginaw River	Northville, Mich	10,000
Dec. 22, 1875	Midland, Mich	Chippewa River	Pine River	Northville, Mich	10,000
Dec. 22, 1875	Dearborn, Mich	Rouge River	Detroit River	Northville, Mich	10,000
Dec. 23, 1875	Oakland County, Mich	Orchard Lake	Rouge River	Northville, Mich	8,000
Dec. 23, 1875	Utica, Mich	Clinton River	Saint Clair Lake	Northville, Mich	12,000
Dec. 23, 1875	Somerset, Mich	River Raisin	Lake Erie	Northville, Mich	10,000
Dec. 23, 1875	Brooklyn, Mich	River Raisin	Lake Erie	Northville, Mich	10,000
Dec. 23, 1875	Oakland County, Mich	Horitoon Lake	Great Lake	Northville, Mich	10,000
Dec. 25, 1875	Port Huron, Mich	Saint Clair River	Lake Huron	Northville, Mich	14,000
Dec. 25, 1875	Port Huron, Mich	Black River	Saint Clair River	Northville, Mich	12,000
Dec. 25, 1875	Ionia, Mich	Maple River	Grand River	Northville, Mich	6,000
Dec. 25, 1875	Clinton County, Mich	Round Lake	Grand River	Northville, Mich	6,000
Dec. 28, 1875	Barry County, Mich	Carter Lake	Lake Michigan	Northville, Mich	6,000
Dec. 28, 1875	Barry County, Mich	Thorn Apple Lake	Grand River	Northville, Mich	6,000
Dec. 28, 1875	Eaton County, Mich	Thorn Apple Lake	Grand River	Northville, Mich	6,000
Dec. 28, 1875	Lenawee County, Mich	Raisin River	Lake Erie	Northville, Mich	10,000
Dec. 28, 1875	Branch County, Mich	Coldwater Lake	Saint Joseph River	Northville, Mich	4,000
Dec. 28, 1875	Branch County, Mich	Lake of the Woods	Saint Joseph River	Northville, Mich	4,000
Dec. 28, 1875	Branch County, Mich	Morrison Lake	Saint Joseph River	Northville, Mich	8,000
Dec. 30, 1875	Cass County, Mich	Barrow Lake	Saint Joseph River	Pokagon, Mich	8,000
Jan. 1, 1876	Cass County, Mich	Muney Lake	Saint Joseph River	Pokagon, Mich	1,000
Jan. 3, 1876	Cass County, Mich	Diamond Lake	Saint Joseph River	Pokagon, Mich	8,000
Jan. 3, 1876	Three Rivers, Mich	Portage River	Saint Joseph River	Pokagon, Mich	4,000
Jan. 3, 1876	Colon, Mich	Sturgeon Lake	Saint Joseph River	Pokagon, Mich	4,000
Jan. 3, 1876	Three Rivers, Mich	Saint Joseph River	Lake Michigan	Pokagon, Mich	8,000
Jan. 3, 1876	Pontiac, Mich	Lord's Lake	Clinton River	Northville, Mich	15,000
Jan. 6, 1876	Battle Creek, Mich	Hamblin Lake	Kalamazoo River	Pokagon, Mich	1,000
Jan. 6, 1876	Grand Rapids, Mich	Reed Lake	Grand River	Pokagon, Mich	4,000
Jan. 6, 1876	Kent County, Mich	Church Lake	Grand River	Pokagon, Mich	2,000
Jan. 6, 1876	Kent County, Mich	Picketel Lake	Grand River	Pokagon, Mich	2,000
Jan. 6, 1876	Kent County, Mich	Lamberton Lake	Grand River	Pokagon, Mich	2,000
Jan. 6, 1876	Kent County, Mich	Soft Water Lake	Grand River	Pokagon, Mich	2,000
Jan. 7, 1876	Clam Lake, Mich	Clam Lake	Muskegon River	Pokagon, Mich	10,000

D.—TABLE II.—*Distribution of California salmon from* 1873 *to* 1880, *inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Estimated number of fish.
Michigan—Cont'd .	Jan. 7, 1876	Kalkaska, Mich	North Boardman River	Grand Traverse Bay	Pokagon, Mich	8,000
	Jan. 7, 1876	Kalkaska County, Mich	Rapid River	Torch Lake	Pokagon, Mich	12,000
	Jan. 8, 1876	Boyne Falls, Mich	Boyne River	Pine Lake	Pokagon, Mich	6,000
	Jan. 8, 1876	Charlevoix County, Mich	Bear Creek	Little Traverse Bay	Pokagon, Mich	4,000
	Jan. 12, 1876	Petoskey, Mich	Pine Lake	Lake Michigan	Pokagon, Mich	26,500
	Jan. 12, 1876		Rifle River	Lake Huron	Pokagon, Mich	23,750
	Jan. 12, 1876		Au Sable River	Lake Huron	Pokagon, Mich	23,750
	Jan. 13, 1876	Lake County, Mich	Big Star Lake	Pere Marquette River	Northville, Mich	14,000
	Jan. 14, 1876	Charlevoix County, Mich	Bear Creek	Walloon Lake	Northville, Mich	16,000
	Jan. 17, 1876		Menominee Lake	Lake Michigan	Pokagon, Mich	30,000
	Jan. 19, 1876	Marquette County, Mich	Michigamee Lake	Menominee River	Northville, Mich	24,000
	Jan. 19, 1876	Marquette County, Mich	Three Lakes	Menominee River	Northville, Mich	8,000
	Feb. 9, 1876	Northville, Mich	Rouge River	Detroit River	Northville, Mich	20,000
	Dec. 21, 1876	Jackson, Mich	Grand River	Lake Michigan	Pokagon, Mich	27,500
	Dec. 22, 1876	Detroit, Mich	Detroit River	Lake Erie	Northville, Mich	20,000
	Dec. 25–8, '76	Holly, Mich	Shiawassee River	Saginaw River	Northville, Mich	75,200
	Dec. 25–8, '76	Crawford County, Mich	Au Sable River	Lake Huron	Northville, Mich	30,000
	Dec. 28, 1876	Washtenaw County, Mich	Huron River	Lake Erie	Northville, Mich	8,000
	Nov. 1, 1877	Wayne County, Mich	Detroit River	Lake Erie	Pokagon, Mich	2,000
	Nov. 18, 1877	Niles, Mich	Private ponds	Saint Joseph River	Pokagon, Mich	300
	Jan. 2, 1878	Cass County, Mich	Pokagon Creek	Saint Joseph River	Pokagon, Mich	3,500
	Jan. 3, 1878	Van Buren County, Mich	Sister Lakes	Lake Michigan	Pokagon, Mich	3,000
	Jan. 9, 1878	Cass County, Mich	Miller Creek		Pokagon, Mich	1,000
	Jan. 10, 1878	Cass County, Mich	Indian Lake		Pokagon, Mich	2,000
	Jan. 22, 1878	Allegan County, Mich	Dumont Lake	Kalamazoo River	Pokagon, Mich	3,500
	Jan. 22, 1878	Allegan County, Mich	Minor Lake	Lake Michigan	Pokagon, Mich	3,500
	Jan. 23, 1878	Charlevoix County, Mich	Wallow Lake	Lake Michigan	Pokagon, Mich	5,000
	Feb. 5, 1878	Howard, Mich	Barron Lake	Lake Michigan	Pokagon, Mich	5,000
	Feb. 14, 1878	Woodstock, Mich	Mallory Lake	Lake Erie	Pokagon, Mich	2,500
	Feb. 14, 1878	Woodstock, Mich	Tiffin River	Maumee River	Pokagon, Mich	2,500
	Feb. 14, 1878	Palmyra, Mich	Palmyra Pond	Raisin River	Pokagon, Mich	2,500
	Feb. 14, 1878	Raisin Centre, Mich	Southard's Lake	Raisin River	Pokagon, Mich	2,500
	Feb. 14, 1878	Hillsdale, Mich	Baw-Beese Lake	Saint Joseph River	Pokagon, Mich	3,000
	Mar. 1, 1878	Watervliet, Mich	Big Paw Paw River	Lake Michigan	Pokagon, Mich	4,000
	Mar. 2, 1878	Saint Joseph, Mich	Ponds	Saint Joseph River	Pokagon, Mich	300
	Mar. 2, 1878	Benton Harbor, Mich	Ponds	Lake Michigan	Pokagon, Mich	300
	Mar. 4, 1878	Calhoun County, Mich	Town Line	Lake Michigan	Pokagon, Mich	2,000
	Mar. 4, 1878	Woodstock, Mich	Silver Lake	Lake Erie	Pokagon, Mich	2,000
	Mar. 4, 1878	Woodstock, Mich	Goose Lake	Lake Erie	Pokagon, Mich	2,000
	Mar. 4, 1878	Putnam, Mich	Patterson Lake	Huron River	Pokagon, Mich	2,000
	Mar. 4, 1878	Putnam, Mich	Half Moon Lake	Huron River	Pokagon, Mich	2,000
	Mar. 4, 1878	Dexter, Mich	Island Lake	Huron River	Pokagon, Mich	2,000
	Mar. 4, 1878	Rochester, Mich	Private pond	Clinton River	Pokagon, Mich	1,000
	Mar. 4, 1878	Dexter, Mich	Silver Lake	Huron River	Pokagon, Mich	2,000

	Apr. 12, 1878	Surrey, Mich	Crooked Lake	Muskegon River	Pokagon, Mich	7,000
	Apr. 29, 1878	Calhoun County, Mich	Gognac Lake	Kalamazoo River	Pokagon, Mich	3,500
	May 3, 1878	Richland, Mich	Gull Lake	Kalamazoo River	Pokagon, Mich	3,000
	May 3, 1878	Richland, Mich	Long Lake	Kalamazoo River	Pokagon, Mich	500
	Nov. 1, 1878	Wayne County, Mich	Detroit River	Lake Erie	Pokagon, Mich	100
	Jan. 6, 1879	Wayne County, Mich	Rouge River	Detroit River	Pokagon, Mich	20,000
	Jan. 8, 1879	Van Buren County, Mich	Buck's Creek	Paw Paw River	Pokagon, Mich	15,000
	Jan. 8, 1879	Van Buren County, Mich	Mill Stream	Paw Paw River	Pokagon, Mich	10,000
	Jan. 9, 1879	Cass County, Mich	Pokagon Creek	Dowagiac River	Pokagon, Mich	10,000
	Jan. 10, 1879	Cass County, Mich	Peavine Creek	Dowagiac River	Pokagon, Mich	5,000
	Jan. 10, 1879	Cass County, Mich	Pine Creek	Lake Michigan	Pokagon, Mich	10,000
	Jan. 23, 1879	Berrien County, Mich	Saint Joseph River	Lake Michigan	Pokagon, Mich	20,000
	Jan. 30, 1879	Jackson County, Mich	Grand River	Lake Michigan	Pokagon, Mich	30,000
	Feb. 7, 1879	Wexford County, Mich	Manistee River	Lake Michigan	Pokagon, Mich	25,000
	Feb. 13, 1879	Monroe, Mich	Raisin River	Lake Erie	Pokagon, Mich	30,000
	Feb. 14, 1879	Saginaw County, Mich	Cass River	Saginaw River	Pokagon, Mich	30,000
	Feb. 26, 1879	Kalamazoo County, Mich	Gourd Neck Lake	Lake Michigan	Pokagon, Mich	2,000
	Feb. 26, 1879	Allegan County, Mich	Miner Lake	Lake Michigan	Pokagon, Mich	1,000
	Feb. 26, 1879	Allegan County, Mich	Mineler Lake	Lake Michigan	Pokagon, Mich	1,000
	Feb. 26, 1879	Allegan County, Mich	Wetmore Lake	Lake Michigan	Pokagon, Mich	1,000
	Feb. 26, 1879	Allegan County, Mich	Lake Sixteen	Lake Michigan	Pokagon, Mich	1,000
	Apr. 19, 1879	Oceana County, Mich	Crystal Lake	Lake Michigan	Pokagon, Mich	500
	Apr. 19, 1879	Oceana County, Mich	Round Lake	Lake Michigan	Pokagon, Mich	500
	July 12, 1879	Romeo, Mich	Private ponds	Clinton River	Pokagon, Mich	346
	Aug. 27, 1879	Cass County, Mich	Barron Lake		Pokagon, Mich	1,500
	Aug. 27, 1879	Cass County, Mich	Salmon Lake		Pokagon, Mich	900
	Fall of 1879	Calhoun County, Mich	Lyon Lake		Pokagon, Mich	150
	Fall of 1879	Calhoun County, Mich	Gongeac Lake		Pokagon, Mich	125
	Fall of 1879	Kalkaska County, Mich	Blue Lake		Pokagon, Mich	200
	Fall of 1879	Tuscola County, Mich	Higgs Lake		Pokagon, Mich	120
Minnesota	May —, 1875	Pine County, Minn	Twin Lakes	Saint Louis River	Saint Paul, Minn	500
	May —, 1875	Pine County, Minn	Big Lake	Saint Louis River	Saint Paul, Minn	500
	May —, 1875	Chisago County, Minn	Saint Croix River	Mississippi River	Saint Paul, Minn	5,000
	May —, 1875	Washington County, Minn	Stillwater	Mississippi River	Saint Paul, Minn	5,000
	May —, 1875	Washington County, Minn	Saint Croix River	Mississippi River	Saint Paul, Minn	5,000
	May —, 1875	Washington County, Minn	Cornelia Lake	Mississippi River	Saint Paul, Minn	750
	May —, 1875	Washington County, Minn	Corman's Lake	Mississippi River	Saint Paul, Minn	410
	May —, 1875	Washington County, Minn	Mayo's Lake	Mississippi River	Saint Paul, Minn	410
	May —, 1875	Washington County, Minn	Soulé's Lake	Mississippi River	Saint Paul, Minn	410
	May —, 1875	Washington County, Minn	May's Lake	Mississippi River	Saint Paul, Minn	410
	May —, 1875	Washington County, Minn	Lilly Lake	Mississippi River	Saint Paul, Minn	410
	May —, 1875	Ramsey County, Minn	White Bear Lake	Saint Croix River	Saint Paul, Minn	300
	May —, 1875	Ramsey County, Minn	Bass Lake	Saint Croix River	Saint Paul, Minn	100
	May —, 1875	Ramsey County, Minn	Lake Como	Saint Croix River	Saint Paul, Minn	100
	May —, 1875	Ramsey County, Minn	Lake Johanna	Saint Croix River	Saint Paul, Minn	100
	May —, 1875	Rice County, Minn	Cannon River	Mississippi River	Saint Paul, Minn	1,000
	May —, 1875	Rice County, Minn	Cedar Lake	Minnesota River	Saint Paul, Minn	1,000
	May —, 1875	Faribault County, Minn	Minnesota Lake	Mississippi River	Saint Paul, Minn	1,000
	May —, 1875	Breckenridge, Minn	Red River of the North	Lake Winnipeg	Saint Paul, Minn	500
	May —, 1875	Dakota County, Minn	Farmington River	Mississippi River	Saint Paul, Minn	1,000
	May —, 1875	Freeborn County, Minn	Lake Albert Lea	Iowa River	Saint Paul, Minn	1,000
	May —, 1875	Mower County, Minn	Iowa River	Cedar River	Saint Paul, Minn	300

D.—TABLE II.—*Distribution of California salmon from 1873 to 1880, inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Estimated number of fish.
Minnesota—Cont'd.	May —, 1875	Chisago County, Minn	Taylor's Falls	Mississippi River	Saint Paul, Minn	1,000
	May —, 1875	Hennepin County, Minn	Lake Minnetonka	Mississippi River	Saint Paul, Minn	500
	May —, 1875	Steele County, Minn	Owatonna River	Mississippi River	Saint Paul, Minn	1,000
	Jan. 14, 1876	Blue Earth County, Minn	Lake Madison	Mississippi River	Red Wing, Minn	275
	May 11, 1876	Ramsey County, Minn	Lake Phalon	Mississippi River	Red Wing, Minn	500
	May 11, 1876	Ramsey County, Minn	Lake Josephine	Mississippi River	Red Wing, Minn	300
	May 11, 1876	Ramsey County, Minn	Lake Johanna	Mississippi River	Red Wing, Minn	300
	May 11, 1876	Ramsey County, Minn	Lake Vadnais	Mississippi River	Red Wing, Minn	250
	May 11, 1876	Ramsey County, Minn	Lake Big Butts	Mississippi River	Red Wing, Minn	250
	May 11, 1876	Ramsey County, Minn	Lake Little Butts	Mississippi River	Red Wing, Minn	250
	May 11, 1876	Dakota County, Minn	Lake Sunfish	Mississippi River	Red Wing, Minn	500
	May 11, 1876	Dakota County, Minn	Lake Kennedy	Mississippi River	Red Wing, Minn	200
	May 11, 1876	Ramsey County, Minn	Lake Como	Mississippi River	Red Wing, Minn	500
	May 11, 1876	Ramsey County, Minn	Lake McCann's	Mississippi River	Red Wing, Minn	500
	May 15, 1876	Washington County, Minn	Butts' Lake	Mississippi River	Red Wing, Minn	500
	May 16, 1876	Hennepin County, Minn	Lake Harriet	Mississippi River	Red Wing, Minn	1,250
	May 16, 1876	Hennepin County, Minn	Lake Calhoun	Mississippi River	Red Wing, Minn	1,250
	May 18, 1876	Ramsey County, Minn	White Bear Lake	Mississippi River	Red Wing, Minn	4,000
	May 18, 1876	Ramsey County, Minn	Bald Eagle Lake	Mississippi River	Red Wing, Minn	2,000
	May 23, 1876	Kandiyohi County, Minn	Green Lake	Crow River	Red Wing, Minn	1,000
	May 23, 1876	Kandiyohi County, Minn	Eagle Lake	Mississippi River	Red Wing, Minn	1,000
		Stevens County, Minn		Pomme de Terre River	Red Wing, Minn	500
	May 23, 1876	Wright County, Minn	Crow River	Mississippi River	Red Wing, Minn	1,000
	May 23, 1876	Swift County, Minn	Chippewa River	Minnesota River	Red Wing, Minn	1,500
	May 23, 1876	Stevens County, Minn	Pomme de Terre River	Minnesota River	Red Wing, Minn	1,500
	May 23, 1876	Grant County, Minn	Mustinka River	Rabbit River	Red Wing, Minn	1,000
	May 25, 1876	Sherburne County, Minn	Hand Lake	Mississippi River	Red Wing, Minn	500
	May 28, 1876	Hennepin County, Minn	Minnetonka Lake	Mississippi River	Red Wing, Minn	10,000
	May 29, 1876	Hennepin County, Minn	Hokah Lake	Mississippi River	Red Wing, Minn	1,500
	May 29, 1876	Rice County, Minn	Lake	Mississippi River	Red Wing, Minn	2,000
	May 29, 1876	Dakota County, Minn	Lake Crystal	Mississippi River	Red Wing, Minn	5,000
	May 29, 1876	Rice County, Minn		Mississippi River	Red Wing, Minn	6,000
	May 29, 1876	Scott County, Minn	Prior Lake	Mississippi River	Red Wing, Minn	20,000
	May 29, 1876	Washington County, Minn	Marine Lake	Mississippi River	Red Wing, Minn	700
	May 29, 1876	Washington County, Minn	Cornelian Lake	Mississippi River	Red Wing, Minn	700
	May 29, 1876	Washington County, Minn	Square Lake	Mississippi River	Red Wing, Minn	600
	June 2, 1876	Ramsey County, Minn	Lake Turtle	Mississippi River	Red Wing, Minn	1,000
	June 2, 1876	Ramsey County, Minn	Lake Josephine	Mississippi River	Red Wing, Minn	1,000
	June 2, 1876	Ramsey County, Minn	Lake Kingsley	Mississippi River	Red Wing, Minn	2,000
	June 2, 1876	Ramsey County, Minn	Lake Hallaron	Mississippi River	Red Wing, Minn	1,000
	June 2, 1876	Carver County, Minn	Lake	Mississippi River	Red Wing, Minn	1,000
	June 2, 1876	Scott County, Minn	Lake	Mississippi River	Red Wing, Minn	5,000
	June 2, 1876	Washington County, Minn	Brown's Creek	Mississippi River	Red Wing, Minn	1,000
	June 2, 1876	Wabasha County, Minn	Mazeppa Creek	Zumbro River	Red Wing, Minn	1 000

June 2, 1876	Washington County, Minn	Eagle Lake	Mississippi River	Red Wing, Minn	1,000
June 2, 1876	Washington County, Minn	School Section	Mississippi River	Red Wing, Minn	1,000
June 2, 1876	Washington County, Minn	Tuy Lake	Mississippi River	Red Wing, Minn	1,000
June 2, 1876	Washington County, Minn	Round Lake	Mississippi River	Red Wing, Minn	1,000
June 2, 1876	Washington County, Minn	McKusic's Lake	Mississippi River	Red Wing, Minn	1,000
June 2, 1876	Washington County, Minn	Pine Tree Lake	Mississippi River	Red Wing, Minn	1,000
June 2, 1876	Lamesborough, Minn		Root River	Red Wing, Minn	2,500
June 2, 1876	Wright County, Minn	Baytown Lake	Mississippi River	Red Wing, Minn	250
June 2, 1876	Washington County, Minn	Lake	Mississippi River	Red Wing, Minn	500
June 2, 1876	McLeod County, Minn	Lake Morrison	Crow River	Red Wing, Minn	250
June 2, 1876	Renville County, Minn	Lake Preston	Mississippi River	Red Wing, Minn	250
June 2, 1876	Washington County, Minn	Lakeland	Mississippi River	Red Wing, Minn	250
June 2, 1876	Dakota County, Minn		Mississippi River	Red Wing, Minn	1,500
June 2, 1876	Rice County, Minn	French Lake	Mississippi River	Red Wing, Minn	1,000
June 2, 1876	Rice County, Minn	Cedar Lake	Mississippi River	Red Wing, Minn	1,000
June 2, 1876	Rice County, Minn	Dudley Lake	Mississippi River	Red Wing, Minn	1,000
June 2, 1876	Rice County, Minn	Robert Lake	Mississippi River	Red Wing, Minn	1,000
June 2, 1876	Rice County, Minn	Shield Lake	Cannon River	Red Wing, Minn	1,000
June 5, 1876	Carver County, Minn	Clear Lake	Mississippi River	Red Wing, Minn	500
June 7, 1876	Cottonwood County, Minn	String Lake	Mississippi River	Red Wing, Minn	300
June 16, 1876	Sherburne County, Minn	Big Lake	Mississippi River	Red Wing, Minn	300
June 16, 1876	Stearns County, Minn	Pearl Lake	Mississippi River	Red Wing, Minn	900
June 16, 1876	Stearns County, Minn	Pleasant Lake	Mississippi River	Red Wing, Minn	900
June 16, 1876	Stearns County, Minn	Grand Lake	Mississippi River	Red Wing, Minn	900
June —, 1876	Blue Earth County, Minn	Loon Lake	Mississippi River	Red Wing, Minn	500
June —, 1876	Watonwan County, Minn	Madelia Lake	Watonwan River	Red Wing, Minn	1,000
June —, 1876	Cottonwood County, Minn	Bingham Lake	Watonwan River	Red Wing, Minn	1,500
June —, 1876	Cottonwood County, Minn	Windom Lake	Des Moines River	Red Wing, Minn	1,000
June —, 1876	Cottonwood County, Minn	Welder Lake	Mississippi River	Red Wing, Minn	1,000
June —, 1876	Noble County, Minn	Okabena Lake	Des Moines River	Red Wing, Minn	1,000
June —, 1876	Blue Earth County, Minn	Eagle Lake	Minnesota River	Red Wing, Minn	1,000
June —, 1876	Blue Earth County, Minn	Madison Lake	Mississippi River	Red Wing, Minn	1,000
June —, 1876	Waseca County, Minn	Elysian Lake	Minnesota River	Red Wing, Minn	1,000
June —, 1876	Waseca County, Minn	Clear Lake	Mississippi River	Red Wing, Minn	1,000
June —, 1876	Le Sueur County, Minn	Lake Emily	Mississippi River	Red Wing, Minn	2,000
June —, 1876	Freeborn County, Minn	Lake Albert Lea	Mississippi River	Red Wing, Minn	1,000
June —, 1876	Freeborn County, Minn	Rickerel Lake	Mississippi River	Red Wing, Minn	1,000
June —, 1876	Faribault County, Minn	Minnesota Lake	Mississippi River	Red Wing, Minn	500
June —, 1876	Faribault County, Minn	Bass Lake	Mississippi River	Red Wing, Minn	1,000
June —, 1876	Blue Earth County, Minn	Lake Laura	Mississippi River	Red Wing, Minn	500
June —, 1876	Kandiyohi, Minn	Green Lake	Crow River	Red Wing, Minn	500
June —, 1876	Chisago County, Minn	Chisago Lake	Mississippi River	Red Wing, Minn	500
June —, 1876	Washington County, Minn	Forest Lake	Mississippi River	Red Wing, Minn	500
June —, 1876	Redwing, Minn	Mississippi River	Gulf of Mexico	Red Wing, Minn	10,000
June —, 1876	Stillwater, Minn	Saint Croix River	Mississippi River	Stillwater, Minn	90,000
June —, 1876	Breckenridge, Minn	Red River	Red River of the North	Red Wing, Minn	500
Feb. 6, 1877	Lake City, Minn	Lake Pepin	Mississippi River	Red Wing, Minn	250
Mar. 24, 1877	Hennepin County, Minn	Lake Armstrong Lake Johnson	Mississippi River Mississippi River	Red Wing, Minn	250
Apr. 14, 1877	Red Wing, Minn	Skillman Pond	Mississippi River	Red Wing, Minn	250
Apr. 19, 1877	Minnetonka, Minn	Long Lake	Mississippi River	Red Wing, Minn	8,000
Apr. 24, 1877	Scott County, Minn	Prior Lake	Mississippi River	Red Wing, Minn	10,000

D.—TABLE II.—*Distribution of California salmon from* 1873 *to* 1880, *inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Estimated number of fish.
Minnesota—Cont'd.	Apr. 26, 1877	Ramsey County, Minn	Lake Phalon	Mississippi River	Red Wing, Minn	250
	Apr. 26, 1877	Washington County, Minn	Silver Lake	Mississippi River	Red Wing, Minn	250
	Apr. 26, 1877	Ramsey County, Minn	Lake Josephine	Mississippi River	Red Wing, Minn	250
	Apr. 26, 1877	Faribault County, Minn	Bass Lake	Mississippi River	Red Wing, Minn	250
	Apr. 26, 1877	Ramsey County, Minn	McCann's Lake	Mississippi River	Red Wing, Minn	250
	Apr. 26, 1877	Stearns County, Minn	Pleasant Lake	Mississippi River	Red Wing, Minn	250
	Apr. 26, 1877	Ramsey County, Minn	Lake Como	Mississippi River	Red Wing, Minn	250
	Apr. 27, 1877	Hennepin County, Minn	Lake Harriet	Mississippi River	Red Wing, Minn	250
	Apr. 27, 1877		Medicine Lake		Red Wing, Minn	250
	Apr. 27, 1877		Shady Oak Lake		Red Wing, Minn	250
	Apr. 27, 1877	Rice County, Minn	Cedar Lake	Mississippi River	Red Wing, Minn	250
	May 2, 1877	Cottonwood County, Minn	Eagle Lake	Mississippi River	Red Wing, Minn	500
	May 2, 1877	Cottonwood County, Minn	Mountain Lake	Mississippi River	Red Wing, Minn	500
	May 2, 1877	Jackson County, Minn	Heron Lake	Des Moines River	Red Wing, Minn	1,500
	May 2, 1877	Nobles County, Minn	Okabeena Lake	Mississippi River	Red Wing, Minn	800
	May 2, 1877	Nobles County, Minn	Ocheeda Lake	Mississippi River	Red Wing, Minn	700
	May 2, 1877	Jackson County, Minn	Lake	Mississippi River	Red Wing, Minn	1,500
	May 2, 1877	Windom, Minn	Des Moines River	Mississippi River	Red Wing, Minn	1,500
	May 2, 1877	Blue Earth County, Minn	Loon Lake	Minnesota River	Red Wing, Minn	750
	May 2, 1877	Blue Earth County, Minn	Clear Lake	Minnesota River	Red Wing, Minn	750
	May 2, 1877	Madelia, Minn	Watonwan River	Minnesota River	Red Wing, Minn	1,500
	May 8, 1877	Chisago County, Minn	Forest Lake	Mississippi River	Red Wing, Minn	1,200
	May 8, 1877	Chisago County, Minn	North Branch	Mississippi River	Red Wing, Minn	3,000
	May 8, 1877	Chisago County, Minn	Rush Lake	Mississippi River	Red Wing, Minn	4,000
	May 8, 1877	Chisago County, Minn	Danewood Lake	Mississippi River	Red Wing, Minn	30
	May 8, 1877	Northfield, Minn	Cedar Lake	Cannon River	Red Wing, Minn	1,000
	May 8, 1877	Faribault, Minn	Fox Lake	Mississippi River	Red Wing, Minn	3,000
	May 8, 1877	Northfield, Minn	Roberts Lake	Cannon River	Red Wing, Minn	1,000
	May 8, 1877	Rice County, Minn	French Lake	Mississippi River	Red Wing, Minn	1,000
	May 11, 1877	Washington County, Minn	Cornelian Lake	Mississippi River	Red Wing, Minn	3,000
	May 11, 1877	Washington County, Minn	Twin Lakes	Mississippi River	Red Wing, Minn	2,000
	May 11, 1877	Washington County, Minn	McKusic's Lake	Mississippi River	Red Wing, Minn	2,500
	May 12, 1877	Scott County, Minn	Prior Lake	Mississippi River	Red Wing, Minn	10,000
	May 15, 1877	Scott County, Minn	O'Dowd's Lake	Mississippi River	Red Wing, Minn	1,000
	May 18, 1877		East Lake		Red Wing, Minn	2,500
	May 18, 1877		West Lake		Red Wing, Minn	2,500
	May 18, 1877		Graham Lake		Red Wing, Minn	2,000
	May 18, 1877		Clear Lake		Red Wing, Minn	2,000
	May 22, 1877	Todd County, Minn	Sauk Lake	Sauk River	Red Wing, Minn	3,000
	May 22, 1877	Douglas County, Minn	Long Prairie River	Crow Wing River	Red Wing, Minn	5,000
	May 22, 1877	Stearns County, Minn	Sauk River	Mississippi River	Red Wing, Minn	1,000
	May 22, 1877	Austin, Minn	Mill Pond	Cedar River	Red Wing, Minn	1,500
	May 22, 1877	Owatonna, Minn	Cannon River	Mississippi River	Red Wing, Minn	3,000
	May 22, 1877	Faribault, Minn	Cannon River	Mississippi River	Red Wing, Minn	1,500

May 22, 1877	Rice County, Minn	Roberts Lake	Mississippi River	Red Wing, Minn	1,500
May 22, 1877	Rice County, Minn	French Lake	Mississippi River	Red Wing, Minn	1,000
May 24, 1877	Rochester, Minn	South Branch	Zumbro River	Red Wing, Minn	1,000
May 24, 1877	Rochester, Minn	Orono River		Red Wing, Minn	500
May 24, 1877	Olmstead County, Minn	Root River		Red Wing, Minn	500
May 26, 1877	Ramsey County, Minn	Lake Johanna	Mississippi River	Red Wing, Minn	600
May 26, 1877	Ramsey County, Minn	Rice's Pond	Mississippi River	Red Wing, Minn	600
May 26, 1877	Washington County, Minn	Bass Lake	Mississippi River	Red Wing, Minn	1,200
May 31, 1877	Hennepin County, Minn	Lake Independence	Mississippi River	Red Wing, Minn	800
May 31, 1877		Christmas Lake	Mississippi River	Red Wing, Minn	800
May 31, 1877	Anoka County, Minn	Round Lake	Mississippi River	Red Wing, Minn	800
May 31, 1877	Meeker County, Minn	Koronis Lake	Mississippi River	Red Wing, Minn	1,000
May 31, 1877	Meeker County, Minn	Ripley Lake	Mississippi River	Red Wing, Minn	1,000
May 31, 1877	Meeker County, Minn	Minnebelle Lake	Mississippi River	Red Wing, Minn	1,200
May 31, 1877		Clearwater Lake	Mississippi River	Red Wing, Minn	2,400
June 5, 1877	Chisago County, Minn	Green Lake	Mississippi River	Red Wing, Minn	1,600
June 5, 1877	Chisago County, Minn	Chisago Lake	Mississippi River	Red Wing, Minn	1,600
June 5, 1877	Pine City, Minn	Snake River	Saint Croix River	Red Wing, Minn	1,600
June 5, 1877	Carlton County, Minn	Moose Lake	Kettle River (Red River of the North).	Red Wing, Minn	800
June 5, 1877	Becker County, Minn	Detroit Lake	Pelican River	Red Wing, Minn	3,200
June 5, 1877	Hawley, Minn	Buffalo River	Red River of the North	Red Wing, Minn	800
June 5, 1877	Moorhead, Minn	Red River of the North	Lake Winnipeg	Red Wing, Minn	2,400
June 5, 1877	Olmstead County, Minn	Root River	Mississippi River	Red Wing, Minn	1,000
June 11, 1877	Wright County, Minn	Lake Charlotte	Mississippi River	Red Wing, Minn	600
June 11, 1877	Kandiyohi County, Minn	Diamond Lake	Mississippi River	Red Wing, Minn	600
June 11, 1877	Kandiyohi County, Minn	Green Lake	Mississippi River	Red Wing, Minn	600
June 11, 1877	Kandiyohi County, Minn	Eagle Lake	Mississippi River	Red Wing, Minn	600
June 11, 1877	Kandiyohi County, Minn	George Lake	Mississippi River	Red Wing, Minn	600
June 11, 1877	Morris, Minn	Pomme de Terre River	Minnesota River	Red Wing, Minn	600
June 11, 1877	Stevens County, Minn		Pomme de Terre River	Red Wing, Minn	1,200
June 11, 1877	Benson, Minn	Chippewa River	Minnesota River	Red Wing, Minn	1,200
June 11, 1877	Swift County, Minn	Saint Mary's Lake	Minnesota River	Red Wing, Minn	600
June 11, 1877	Swift County, Minn	Saint Malashy's Lake	Minnesota River	Red Wing, Minn	600
June 11, 1877	Stevens County, Minn	McCarthy's Lake	Minnesota River	Red Wing, Minn	600
June 11, 1877	Morris, Minn	Pomme de Terre River	Minnesota River	Red Wing, Minn	600
June 11, 1877	Wilkin County, Minn	Bois de Sioux River	Red River of the North	Red Wing, Minn	300
June 11, 1877	Otter Tail County, Minn	Otter Tail River	Red River	Red Wing, Minn	300
June 15, 1877	Blue Earth County, Minn	Madison Lake	Minnesota River	Red Wing, Minn	4,000
June 19, 1877	Wright County, Minn	Sugar Lake	Mississippi River	Red Wing, Minn	500
June 19, 1877	Wright County, Minn	Pulaski	Mississippi River	Red Wing, Minn	500
June 19, 1877	Anoka County, Minn	Round Lake	Mississippi River	Red Wing, Minn	500
June 19, 1877	Sherburne County, Minn	Clear Lake	Mississippi River	Red Wing, Minn	500
June 19, 1877	Todd County, Minn	Osakin Lake	Sauk River	Red Wing, Minn	1,500
June 19, 1877	Sherburne County, Minn	Briggs Lake	Mississippi River	Red Wing, Minn	500
June 19, 1877	Stearns County, Minn	Cornelian Lake	Mississippi River	Red Wing, Minn	500
June 19, 1877	Stearns County, Minn	Kimball Lake	Mississippi River	Red Wing, Minn	500
June 19, 1877	Stearns County, Minn	Silver Lake	Mississippi River	Red Wing, Minn	500
June 19, 1877	Avon, Minn	Spunk Creek	Mississippi River	Red Wing, Minn	500
June 19, 1877	Anoka County Minn	Crooked Lake	Mississippi River	Red Wing, Minn	500
June 19, 1877		George Lake		Red Wing, Minn	500
June 19, 1877		Coon Lake		Red Wing, Minn	500

D.— TABLE II.—*Distribution of California salmon from* 1873 *to* 1880, *inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Estimated number of fish.
Minnesota—Cont'd.	June 29, 1877	Kasota, Minn	Minnesota River	Mississippi River	Red Wing, Minn	1,500
	June 29, 1877	Sibley County, Minn	Silver Lake	Mississippi River	Red Wing, Minn	500
	June 29, 1877	Sibley County, Minn	Horse Shoe Lake	Mississippi River	Red Wing, Minn	500
	June 29, 1877	Le Sueur County, Minn	Lake Emily	Mississippi River	Red Wing, Minn	1,000
	June 29, 1877	Blue Earth County, Minn	Lake Crystal	Mississippi River	Red Wing, Minn	1,500
	June 29, 1877		Long Lake		Red Wing, Minn	500
	June 29, 1877		McKinsie Lake		Red Wing, Minn	500
	June 29, 1877		Mary's Lake		Red Wing, Minn	1,000
	June 29, 1877	Watonwan County, Minn	Saint James' Lake	Watonwan River	Red Wing, Minn	500
	Aug. 6, 1877	Scott County, Minn	Prior Lake	Mississippi River	Red Wing, Minn	5,000
	Spring, 1878	Blue Earth County, Minn	Minnesota River	Mississippi River	Willow Brook, Minn	1,000
	Spring, 1878	Brown County, Minn	Sleepy Eye Lake	Cottonwood River	Willow Brook, Minn	1,000
	Spring, 1878	Brown County, Minn	Clear Lake	Minnesota River	Willow Brook, Minn	1,000
	Spring, 1878	Brown County, Minn	Hanska Lake	Minnesota River	Willow Brook, Minn	1,000
	Spring, 1878	Carlton County, Minn	Moose Lake	Kettle River	Willow Brook, Minn	1,000
	Spring, 1878	Carlton County, Minn	Bear Lake	Kettle River	Willow Brook, Minn	1,000
	Spring, 1878	Carlton County, Minn	Echo Lake	Kettle River	Willow Brook, Minn	1,000
	Spring, 1878	Carlton County, Minn	Moose-Horn Lake	Kettle River	Willow Brook, Minn	1,000
	Spring, 1878	Carlton County, Minn	Chubb Lake	Kettle River	Willow Brook, Minn	1,000
	Spring, 1878	Carlton County, Minn	Hanging Horn	Kettle River	Willow Brook, Minn	1,000
	Spring, 1878	Fond du Lac, Minn	Saint Louis River	Lake Superior	Willow Brook, Minn	2,000
	Spring, 1878	Carver County, Minn	Waconia Lake	Mississippi River	Willow Brook, Minn	2,000
	Spring, 1878	Carver County, Minn	Mennewasta River	Mississippi River	Willow Brook, Minn	500
	Spring, 1878	Dakota County, Minn	Kennedy Lake	Mississippi River	Willow Brook, Minn	1,000
	Spring, 1878	Dakota County, Minn	Lake Early	Mississippi River	Willow Brook, Minn	500
	Spring, 1878	Dakota County, Minn	South Branch	Vermillion River	Willow Brook, Minn	500
	Spring, 1878	Dakota County, Minn	Farquhar Lake	Mississippi River	Willow Brook, Minn	200
	Spring, 1878	Dakota County, Minn	McGrath's Lake	Mississippi River	Willow Brook, Minn	500
	Spring, 1878	Dakota County, Minn	Twin Lakes	Mississippi River	Willow Brook, Minn	1,000
	Spring, 1878	Freeborn County, Minn	Alden Lake	Mississippi River	Willow Brook, Minn	1,000
	Spring, 1878	Freeborn County, Minn	Pickerel Lake	Mississippi River	Willow Brook, Minn	1,000
	Spring, 1878	Grant County, Minn	Patchen's Lake		Willow Brook, Minn	2,000
	Spring, 1878	Grant County, Minn	Twin Lakes		Willow Brook, Minn	2,000
	Spring, 1878	Grant County, Minn	Haskins Lake		Willow Brook, Minn	2,000
	Spring, 1878	Goodhue County, Minn	Bell Creek	Cannon River	Willow Brook, Minn	5,000
	Spring, 1878	Hennepin County, Minn	Minnetonka Lake	Mississippi River	Willow Brook, Minn	3,000
	Spring, 1878	Hennepin County, Minn	Lake Rebecca	Mississippi River	Willow Brook, Minn	1,000
	Spring, 1878	Hennepin County, Minn	Lydard Lake	Mississippi River	Willow Brook, Minn	1,000
	Spring, 1878	Houston County, Minn	Hokah Creek	Root River	Willow Brook, Minn	2,000
	Spring, 1878	Houston County, Minn	Silver Lake	Mississippi River	Willow Brook, Minn	2,000
	Spring, 1878	Houston County, Minn	Como Lake	Mississippi River	Willow Brook, Minn	4,000
	Spring, 1878	Le Sueur County, Minn	Lake Emily	Mississippi River	Willow Brook, Minn	2,000
	Spring, 1878	Le Sueur County, Minn	Lake Washington	Cannon River	Willow Brook, Minn	1,660
	Spring, 1878	Le Sueur County, Minn	Lake Jefferson	Cannon River	Willow Brook, Minn	3,000

Spring, 1878	Mower County, Minn	Little Iowa River	Mississippi River	Willow Brook, Minn	3,000
Spring, 1878	Pope County, Minn	Lake Peterson	Mississippi River	Willow Brook, Minn	1,000
Spring, 1878	Pope County, Minn	Chippewa River	Mississippi River	Willow Brook, Minn	1,000
Spring, 1878	Ramsey County, Minn	Krameroth's Pond	Mississippi River	Willow Brook, Minn	200
Spring, 1878	Ramsey County, Minn	Gervais Lake	Mississippi River	Willow Brook, Minn	3,500
Spring, 1878	Rice County, Minn	Roberts Lake	Mississippi River	Willow Brook, Minn	1,000
Spring, 1878	Rice County, Minn	Dudley Lake	Mississippi River	Willow Brook, Minn	1,000
Spring, 1878	Rice County, Minn	Cedar Lake	Mississippi River	Willow Brook, Minn	1,000
Spring, 1878	Rice County, Minn	French Lake	Mississippi River	Willow Brook, Minn	2,000
Spring, 1878	Rice County, Minn	Shields Lake	Mississippi River	Willow Brook, Minn	1,000
Spring, 1878	Rice County, Minn	Union Lake	Mississippi River	Willow Brook, Minn	1,000
Spring, 1878	Rice County, Minn	Circle Lake	Mississippi River	Willow Brook, Minn	1,000
Spring, 1878	Rice County, Minn	Horse Shoe Lake	Mississippi River	Willow Brook, Minn	2,000
Spring, 1878	Rice County, Minn	Spring Creek	Mississippi River	Willow Brook, Minn	1,000
Spring, 1878	Rice County, Minn	Cannon River	Mississippi River	Willow Brook, Minn	1,000
Spring, 1878	Rice County, Minn	Gillmore's Creek	Mississippi River	Willow Brook, Minn	1,000
Spring, 1878	Scott County, Minn	Credit Lake	Mississippi River	Willow Brook, Minn	3,500
Spring, 1878	Scott County, Minn	Prior Lake	Mississippi River	Willow Brook, Minn	3,500
Spring, 1878	Scott County, Minn	Spring Lake	Mississippi River	Willow Brook, Minn	4,000
Spring, 1878	Scott County, Minn	O'Dowd's Lake	Mississippi River	Willow Brook, Minn	4,000
Spring, 1878	Sherburne County, Minn	Briggs Lake	Mississippi River	Willow Brook, Minn	1,000
Spring, 1878	Sherburne County, Minn	Rush Lake	Mississippi River	Willow Brook, Minn	1,000
Spring, 1878	Sherburne County, Minn	Lake Julia	Mississippi River	Willow Brook, Minn	1,000
Spring, 1878	Stearns County, Minn	Pearl Lake	Sauk River	Willow Brook, Minn	2,000
Spring, 1878	Stearns County, Minn	Pleasant Lake	Mississippi River	Willow Brook, Minn	4,000
Spring, 1878	Stearns County, Minn	Grand Lake	Mississippi River	Willow Brook, Minn	1,000
Spring, 1878	Stearns County, Minn	Kimball Lake	Mississippi River	Willow Brook, Minn	1,000
Spring, 1878	Stearns County, Minn	Cornelian Lake	Mississippi River	Willow Brook, Minn	1,000
Spring, 1878	Stearns County, Minn	Saint John's Lake	Mississippi River	Willow Brook, Minn	3,000
Spring, 1878	Stevens County, Minn	Gavin's Lake	Minnesota River	Willow Brook, Minn	1,000
Spring, 1878	Stevens County, Minn	Eagle Lake	Minnesota River	Willow Brook, Minn	1,000
Spring, 1878	Stevens County, Minn	Frog Lake	Minnesota River	Willow Brook, Minn	1,000
Spring, 1878	Stevens County, Minn	Donnelly Lake	Minnesota River	Willow Brook, Minn	1,000
Spring, 1878	Swift County, Minn	Hassel Lake	Chippewa River	Willow Brook, Minn	1,000
Spring, 1878	Mazeppa, Minn	Zumbro River	Mississippi River	Willow Brook, Minn	1,000
Spring, 1878	Wabasha County, Minn	N. Br., Zumbro River	Mississippi River	Willow Brook, Minn	2,000
Spring, 1878	Washington County, Minn	Clear Lake	Mississippi River	Willow Brook, Minn	1,000
Spring, 1878	Washington County, Minn	Tanner's Lake	Mississippi River	Willow Brook, Minn	500
Spring, 1878	Wilkin County, Minn	Red River of the North	Winnipeg River	Willow Brook, Minn	3,000
Spring, 1878	Winona County, Minn	Brown's Mill Pond	Mississippi River	Willow Brook, Minn	200
Spring, 1878	Wright County, Minn	Clearwater Lake	Mississippi River	Willow Brook, Minn	3,000
Apr. 24, 1879	Goodhue County, Minn	Mill-pond	Mississippi River	Willow Brook, Minn	2,000
May 13, 1879	Stacy, Minn	Goose Creek		Willow Brook, Minn	3,000
May 23, 1879	Washington County, Minn	Silver Lake	Saint Croix River	Willow Brook, Minn	1,000
June 20, 1879	Mower County, Minn	Mary's Lake	Mississippi River	Willow Brook, Minn	1,000
June 24, 1879	Watonwan County, Minn	Cedar Lakes	Minnesota River	Willow Brook, Minn	3,000
July 1, 1879	Renville County, Minn	Lake Alley	Minnesota River	Willow Brook, Minn	2,000
July 1, 1879	Renville County, Minn	Lake Preston	Minnesota River	Willow Brook, Minn	2,000
July 21, 1879	Martin County, Minn	Chain Lake	Blue Earth River	Willow Brook, Minn	5,000
July 24, 1879	Le Sueur County, Minn	Lake Letook	Minnesota River	Willow Brook, Minn	2,500
July 24, 1879	Le Sueur County, Minn	Lake Takota	Minnesota River	Willow Brook, Minn	2,500
July 31, 1879	Waseca County, Minn	Lake Elysian	Minnesota River	Willow Brook, Minn	5,000

D.—TABLE II.—*Distribution of California salmon from* 1873 *to* 1880, *inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Estimated number of fish.
Minnesota—Cont'd.	Sept. 18, 1879	Douglas County, Minn	Lakes	Minnesota River	Willow Brook, Minn	3,000
	Sept. 18, 1879	Wright County, Minn	Pelican Lake	Mississippi River	Willow Brook, Minn	3,000
	Oct. 23, 1879	Washington County, Minn	Lake Elmo	Saint Croix River	Willow Brook, Minn	2,000
	Nov. 11, 1879		Lake Koronis	Crow River	Willow Brook, Minn	3,000
	Nov. 11, 1879	Stevens County, Minn	Lake Foss	Pomme de Terre River	Willow Brook, Minn	2,000
	May 4, 1880	Ortonville, Minn	Big Stone Lake	Pomme de Terre River	Willow Brook, Minn	3,000
	June 3, 1880	Nobles County, Minn	Round Lake	Mississippi River	Willow Brook, Minn	4,000
	June 7, 1880	Crookston, Minn	Red Lake River	Red River of the North	Willow Brook, Minn	4,000
	June 24, 1880	Dakota County, Minn	Twin Lakes	Mississippi River	Willow Brook, Minn	2,000
	July 1, 1880	Blue Earth County, Minn	Crystal Lake	Minnesota River	Willow Brook, Minn	3,000
	July 12, 1880	Waseca County, Minn	Elysian Lake	Maple River	Willow Brook, Minn	4,000
	July 23, 1880	Frazee City, Minn	Otter Tail River	Red River of the North	Willow Brook, Minn	3,000
	July 23, 1880	Lake Park, Minn	Lake	Buffalo River	Willow Brook, Minn	1,000
	Aug. 30, 1880	Minneapolis, Minn	Mississippi River	Gulf of Mexico	Willow Brook, Minn	200
	Nov. 6, 1880		Christmas Lake		Willow Brook, Minn	1,000
Mississippi	Dec. 11, 1876	Abbeville, Miss	Yazoo River	Mississippi River	Northville, Mich	10,800
	Dec. 11, 1876	Meridian, Miss	Chickasawha River	Pascagoula River	Northville, Mich	15,200
	Dec. 11, 1876	Jackson, Miss	Forked Deer River	Pearl River	Northville, Mich	6,600
	Dec. 12, 1876	Kosciusko, Miss	Pearl River	Lake Borgne	Northville, Mich	10,800
Missouri	Dec. 15, 1876	Pacific, Mo	Meramec River	Mississippi River	Northville, Mich	15,600
	Dec. 15, 1876	Jerome, Mo	Gasconade River	Missouri River	Northville, Mich	15,400
	Dec. —, 1878	Pierce City, Mo	Capo Creek		Northville, Mich	1,000
	Dec. —, 1878	Pierce City, Mo	Capo Creek		Northville, Mich	1,000
	Dec. —, 1878	Franklin, Mo	Meramec River	Mississippi River	Anamosa, Iowa	75,000
	Dec. —, 1878	Carthage, Mo	Spring River	Arkansas River	Anamosa, Iowa	75,000
	Dec. 18, 1879	Wayne County, Mo	Saint Frances River	Mississippi River	Cedar Rapids, Iowa	15,000
	Dec. 18, 1879	Wayne County, Mo	Black River	White River	Cedar Rapids, Iowa	30,000
	Dec. 18, 1879	Doniphan, Mo	Currant River	White River	Cedar Rapids, Iowa	15,000
	Dec. 18, 1879	Carthage, Mo	Spring River	Arkansas River	Cedar Rapids, Iowa	30,000
	Dec. 18, 1879	Saint Mary, Mo	Saline River	Mississippi River	Cedar Rapids, Iowa	10,000
	—, 1879	Franklin, Mo	Meramec River	Mississippi River	Cedar Rapids, Iowa	90,000
	Jan. 21, 1880	Saint Joseph, Mo	Missouri River	Mississippi River	Saint Joseph, Mo	20,000
	Jan. 24, 1880	Buchanan County, Mo	Lake Contrary	Missouri River		20,000
	Feb. 9, 1880	Platte County, Mo	Sugar Lake	Missouri River	Saint Joseph, Mo	5,000
	Feb. 9, 1880	Platte County, Mo	Bean's Lake	Missouri River	Saint Joseph, Mo	5,000
	Feb. 22, 1880	Buchanan County, Mo	Platte River	Missouri River	Saint Joseph, Mo	5,000
	Feb. 22, 1880	Buchanan County, Mo	One-Hundred-and-Two River	Platte River	Saint Joseph, Mo	5,000
	Feb. 24, 1880	Gentry County, Mo	Grand River	Missouri River	Saint Joseph, Mo	10,000
	Mar. 4, 1880	Shelby County, Mo	Salt River	Mississippi River	Saint Joseph, Mo	10,000
	Mar. 4, 1880	Macon County, Mo	Charlton River	Missouri River	Saint Joseph, Mo	10,000
	Mar. 8, 1880	Jerome, Mo	Gasconade River	Missouri River	Saint Joseph, Mo	10,000
	Mar. 15, 1880	Lexington, Mo	Missouri River	Mississippi River	Saint Joseph, Mo	10,000
	Mar. 19, 1880	Independence, Mo	Blue River		Saint Joseph, Mo	10,000
	Mar. 23, 1880	Schell City, Mo	Osage River	Missouri River	Saint Joseph, Mo	10,000

	Mar. 23, 1880	Morgan County, Mo	Lamine River	Missouri River	Saint Joseph, Mo	10,000
	Apr. 5, 1880	Clinton County, Mo	Smith's Fork of Platte River	Missouri River	Saint Joseph, Mo	10,000
	Apr. 11, 1880	Buchanan County, Mo	Missouri River	Mississippi River	Saint Joseph, Mo	15,000
	June —, 1880	Saint Joseph, Mo	Hatchery Ponds		Saint Joseph, Mo	2,500
Nebraska	Jan. —, 1880	Lincoln, Nebr	Salt Creek	Platte River	South Bend, Nebr	5,000
	Jan. 21, 1880	Beatrice, Nebr	Big Blue River	Kansas River	South Bend, Nebr	5,000
	Jan. 29, 1880	McArdleville, Nebr	Big Panillion	Platte River	South Bend, Nebr	5,000
	Jan. —, 1880	Otoe County, Nebr	Four Mile Creek	Little Nemaha River	South Bend, Nebr	5,000
	Jan. —, 1880	North Platte, Nebr	Birdwood Creek	North Platte River	South Bend, Nebr	5,000
	Jan. —, 1880	Clarksville, Nebr	Prairie Creek	Platte River	South Bend, Nebr	5,000
	Jan. —, 1880	Fremont, Nebr	Rawhide Creek	Elkhorn River	South Bend, Nebr	5,000
	Jan. —, 1880	Pebble, Nebr	Pebble Creek	Elkhorn River	South Bend, Nebr	5,000
	Jan. —, 1880	Crete, Nebr	Big Blue River	Kansas River	South Bend, Nebr	5,000
Nevada	Mar. —, 1879	Reno, Nev	Truckee River	Bear River	McCloud River Station	190,000
	Mar. —, 1879	Carson River, Nev	Mexican Dam	Carson River	McCloud River Station	10,000
New Hampshire	Spring, 1876	Warren, N. H	Baker's River	Merrimac River	Winchester, Mass	50,000
	Dec. 1876	Campton, N. H	Pemigewasset River	Merrimac River	Winchester, Mass	40,000
	Dec. 5, 1876	Plymouth, N. H	Pemigewasset River	Merrimac River	Winchester, Mass	40,000
	Dec. 5, 1876	Warren, N. H	Baker's River	Merrimac River	Winchester, Mass	20,000
	Dec. —, 1877	Woodstock, N. H	Headwaters	Merrimac River	Winchester, Mass	10,000
	Jan. 11, 1878	Plymouth, N. H	Baker's River	Merrimac River	Plymouth, N. H	20,000
	Jan. 12, 1878	Hillsborough Bridge, N. H	Contoocook River	Merrimac River	Plymouth, N. H	20,000
	Jan. 14, 1878	Campton, N. H	Pemigewasset River	Merrimac River	Plymouth, N. H	30,000
	Jan. 14, 1878	Plymouth, N. H	Pemigewasset River	Merrimac River	Plymouth, N. H	30,000
	Feb. 1, 1879	Campton, N. H	Pemigewasset River	Merrimac River	Plymouth, N. H	158,500
	Feb. 1, 1879	Plymouth, N. H	Pemigewasset River	Merrimac River	Plymouth, N. H	158,500
	Mar. 14, 1879	Wakefield, N. H	Newechewannock Lake	Salmon Falls	Plymouth, N. H	5,000
	Mar. 14, 1879	Wilton, N. H	Tri Echo Lake	Salmon Falls	Plymouth, N. H	5,000
	Mar. 14, 1879	Wakefield, N. H	Lorewell's Pond	Salmon Falls	Plymouth, N. H	5,000
	Mar. 14, 1879	Brookfield, N. H	Cook's Pond	Salmon Falls	Plymouth, N. H	5,000
	Mar. 14, 1879	Wolfborough, N. H	Smith's Pond	Lake Winnipesaukee	Plymouth, N. H	10,000
	Mar. 14, 1879	Hillsborough Bridge, N. H	Contoocook River	Merrimac River	Plymouth, N. H	20,000
New Jersey	Jan. 1, 1874	Bloomsbury, N. J	Delaware River	Delaware Bay	Bloomsbury, N. J	10,000
	Jan. 10, 1874	Bloomsbury, N. J	Pohatcong River	Delaware River	Bloomsbury, N. J	10,000
	Jan. 13, 1874	Raritan, N. J	Pattenburgh Creek	Raritan River	Bloomsbury, N. J	12,000
	Jan. 14, 1874	Bloomsbury, N. J	Pohatcong River	Delaware River	Bloomsbury, N. J	13,000
	Jan. 26, 1874	Bloomsbury, N. J	Musconetcong River	Delaware River	Bloomsbury, N. J	25,000
	Feb. 6, 1874	Bloomsbury, N. J	Musconetcong River	Delaware River	Bloomsbury, N. J	30,000
	Feb. 7, 1874	Raritan, N. J	Pattenburgh Creek	Raritan River	Bloomsbury, N. J	35,000
	Feb. 14, 1874	Bloomsbury, N. J	Musconetcong River	Delaware River	Bloomsbury, N. J	50,000
	Feb. 16, 1874	Bloomsbury, N. J	Ponds	Delaware River	Bloomsbury, N. J	50,000
	Jan. —, 1875	Warren County, N. J	Pequest River	Delaware River	Bloomsbury, N. J	50,000
	Jan. —, 1875	Hunterdon County, N. J	Musconetcong River	Delaware River	Bloomsbury, N. J	50,000
	Jan. —, 1875	Hunterdon County, N. J	South Branch, Raritan River	Delaware River	Bloomsbury, N. J	40,000
	Jan. —, 1875	Paterson, N. J	Ramapo River	Passaic River	Bloomsbury, N. J	2,000
	Jan. —, 1875	Hunterdon County, N. J	North and South Branch	Raritan River	Bloomsbury, N. J	3,000
	Nov. 28, 1876	Tuckahoe, N. J	Tuckahoe River	Great Egg Harbor River	New York City Aquarium	2,000
	Dec. 1, 1876	Dennisville, N. J	Dennis Creek	Delaware Bay	New York City Aquarium	2,500
	Dec. 4, 1876	Allowaystown, N. J	Alloway's Creek	Delaware River	New York City Aquarium	2,000
	Dec. 11, 1876	Vineland, N. J	Maurice River	Delaware Bay	New York City Aquarium	2,500
	Dec. 15, 1876	May's Landing, N. J	Great Egg Harbor River	Great Egg Harbor	New York City Aquarium	3,000
	Dec. 18, 1876	Glassborough, N. J	Mantua Creek	Delaware River	New York City Aquarium	1,500

D.—TABLE II.—*Distribution of California salmon from* 1873 *to* 1880, *inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Estimated number of fish.
New Jersey—Continued.	Dec. 20, 1876	Woodstown, N. J	Salem Creek	Delaware River	New York City Aquarium	3,000
	Dec. 22, 1876	Swedesborough, N. J	Oldman's Creek	Delaware River	New York City Aquarium	2,500
	Dec. 27, 1876	Williamstown, N. J	Great Egg Harbor River	Great Egg Harbor	New York City Aquarium	3,500
	Jan. —, 1877	Wenonah, N. J	Mantua Creek	Delaware River	New York City Aquarium	12,000
	Jan. —, 1877	Bloomfield, N. J	Greenwood Lake	Wallkill River	New York City Aquarium	2,000
	Feb. 1, 1877	Weymouth, N. J	Great Egg Harbor River	Great Egg Harbor	New York City Aquarium	2,000
	Feb. 5, 1877	Bridgeton, N. J	Cohansey Creek	Delaware River	New York City Aquarium	2,500
	Feb. 16, 1877	Burlington County, N. J	Mullicus River	Little Egg Harbor	New York City Aquarium	2,000
	Feb. 19, 1877	Winslow, N. J	Great Egg Harbor River	Great Egg Harbor	New York City Aquarium	2,300
	Feb. 22, 1877	Woodbury, N. J	Woodbury Creek	Delaware River	New York City Aquarium	250
	Feb. 22, 1877	Woodbury, N. J	Timber Creek	Delaware River	New York City Aquarium	250
	Feb. 23, 1877	Egg Harbor City, N. J	Mullicus River	Little Egg Harbor	New York City Aquarium	2,000
	—— —, 1877	Wenonah, N. J	Mantua Creek	Delaware River	New York City Aquarium	11,000
	Dec. 8, 1877	Cumberland County, N. J	Maurice River	Delaware Bay	New Hope, Pa	3,000
	Dec. 13, 1877	Atlantic County, N. J	Great Egg Harbor River	Great Egg Harbor	New Hope, Pa	6,000
	Dec. 13, 1877	Burlington County, N. J	Mullicus River	Little Egg Harbor	New Hope, Pa	6,000
	Dec. 17, 1877	Gloucester County, N. J	Mantua Creek	Delaware River	New Hope, Pa	3,000
	Dec. 20, 1877	Cumberland County, N. J	Cohansey Creek	Delaware River	New Hope, Pa	7,000
	Dec. 20, 1877	Cumberland County, N. J	Maurice River	Delaware Bay	New Hope, Pa	7,000
	Dec. 22, 1877	Gloucester County, N. J	Mantua River	Delaware River	New Hope, Pa	1,000
	Dec. 22, 1877	Gloucester County, N. J	Raccoon Creek	Delaware River	New Hope, Pa	1,000
	Dec. 22, 1877	Gloucester County, N. J	Oldman's Creek	Delaware River	New Hope, Pa	1,000
	Dec. 24, 1877	Gloucester County, N. J	Timber Creek	Delaware River	New Hope, Pa	3,000
	Dec. 26, 1877	Burlington County, N. J	Mullicus River	Little Egg Harbor	New Hope, Pa	6,000
	Dec. 29, 1877	Allowaystown, N. J	Alloway's River	Delaware River	New Hope, Pa	6,000
	Jan. 3, 1878	Burlington County, N. J	Mullicus River	Little Egg Harbor	New Hope, Pa	3,000
	Jan. 3, 1878	Atlantic County, N. J	Great Egg Harbor River	Great Egg Harbor	New Hope, Pa	3,000
	Jan 4, 1878	Gloucester County, N. J	Mantua Creek	Delaware River	New Hope, Pa	1,000
	Jan. 7, 1878	Cumberland County, N. J	Maurice River	Delaware Bay	New Hope, Pa	6,000
	Jan. 25, 1878	Cape May County, N. J	Tuckahoe River	Great Egg Harbor River	New Hope, Pa	4,000
	Fall, 1878	Trenton, N. J	Shoemaker's Eddy	Delaware River	Bloomsbury, N. J	150,000
	Fall, 1878	Atlantic County, N. J	Great Egg Harbor River	Great Egg Harbor	Bloomsbury, N. J	50,000
	Fall, 1878	Salem County, N. J	Alloway's Creek	Delaware River	Bloomsbury, N. J	25,000
	Fall, 1878	Cumberland County, N. J	Maurice River	Delaware Bay	Bloomsbury, N. J	25,000
	Fall, 1878	Gloucester County, N. J	Raccoon Creek	Delaware River	Bloomsbury, N. J	25,000
	Fall, 1878	Burlington County, N. J	Mullicus River	Little Egg Harbor	Bloomsbury, N. J	25,000
	Fall, 1878	Passaic County, N. J	Greenwood Lake	Greenwood Lake	Bloomsbury, N. J	22,000
	Spring, 1879	Somerset County, N. J	North Branch	Raritan River	Bloomsbury, N. J	30,000
	Spring, 1879	Somerset County, N. J	Rockaway River	Passaic River	Bloomsbury, N. J	30,000
	Spring, 1879	Bergen County, N. J	Hackensack River	Newark Bay	Bloomsbury, N. J	30,000
	Spring, 1879	Morris County, N. J	Lake Hopatcong		Bloomsbury, N. J	5,000
	Spring, 1879		Shaungum Lake		Bloomsbury, N. J	5,000
	Spring, 1879		Silver Lake		Bloomsbury, N. J	3,000
	Spring, 1879	Sussex County, N. J	Swartswood Lake		Bloomsbury, N. J	10,000

	Spring, 1879		Verona Lake		Bloomsbury, N. J	3,000
	Spring, 1879		Cline's Pond		Bloomsbury, N. J	10,000
	—, 1879	Trenton, N. J	Shoemaker's Eddy	Delaware River	Bloomsbury, N. J	390,000
	—, 1879	Warren County, N. J	Paulinskill Creek	Delaware River	Bloomsbury, N. J	30,000
	Dec. 6, 1880	Shoemaker's, Pa	Shoemaker's Eddy	Delaware River	State Hatchery	30,000
	Dec. 7, 1880	Shoemaker's, Pa	Shoemaker's Eddy	Delaware River	State Hatchery	30,000
	Dec. 13, 1880	Shoemaker's, Pa	Shoemaker's Eddy	Delaware River	State Hatchery	30,000
	Dec. 14, 1880	Shoemaker's, Pa	Shoemaker's Eddy	Delaware River	State Hatchery	30,000
	Dec. 17, 1880	Shoemaker's, Pa	Shoemaker's Eddy	Delaware River	State Hatchery	30,000
	Dec. 18, 1880	Shoemaker's, Pa	Shoemaker's Eddy	Delaware River	State Hatchery	30,000
	Dec. 20, 1880	Shoemaker's, Pa	Shoemaker's Eddy	Delaware River	State Hatchery	30,000
	Dec. 23, 1880	Shoemaker's, Pa	Shoemaker's Eddy	Delaware River	State Hatchery	30,000
	Mar. 24, 1881	Shoemaker's, Pa	Shoemaker's Eddy	Delaware River	State Hatchery	14,000
	Mar. 25, 1881	Shoemaker's, Pa	Shoemaker's Eddy	Delaware River	State Hatchery	14,000
	Mar. 26, 1881	Shoemaker's, Pa	Shoemaker's Eddy	Delaware River	State Hatchery	11,429
New York	Dec. 22, 1873	Monroe County, N. Y	Allen Creek	Genesee River	Caledonia, N. Y	15,000
	Dec. 23, 1873		Fortville Creek	Hudson River	Caledonia, N. Y	24,000
	Dec. 25, 1873		Beaver Creek	Salmon River	Caledonia, N. Y	17,000
	Dec. 26, 1873		Caledonia Springs	Genesee River	Caledonia, N. Y	2,000
	Dec. 27, 1873	Liberty, N. Y	Cohocton River	Susquehanna River	Caledonia, N. Y	16,000
	Dec. 29, 1873		Fish Creek	Oswego River	Caledonia, N. Y	18,000
	Dec. 30, 1873	Monroe County, N. Y	Allen Creek	Genesee River	Caledonia, N. Y	16,000
	Jan. 6, 1874		Sauquoit Creek	Hudson River	Caledonia, N. Y	6,000
	Jan. 6, 1874		Oriskany River	Hudson River	Caledonia, N. Y	6,000
	Jan. 19, 1874	Queens County, N. Y		Long Island Sound	Caledonia, N. Y	4,000
	Jan. 23, 1874		Brooklyn Waterworks	Long Island Sound	Bloomsbury, N. J	30,000
	Feb. 3, 1874	Herkimer County, N. Y	West Canada Creek	Hudson River	Caledonia, N. Y	1,500
	Feb. 5, 1874	Dutchess County, N. Y	Fishkill Lake	Hudson River	Caledonia, N. Y	700
	Feb. 5, 1874		Silver Lake	Hudson River	Caledonia, N. Y	800
	Feb. 10, 1874		Oneida Lake	Oswego River	Caledonia, N. Y	13,000
	Feb. 10, 1874	Sayville, N. Y	Roosevelt Creek	Long Island Sound	Caledonia, N. Y	90,000
	Feb. 14, 1874	Herkimer County, N. Y	Jocks Lake	Hudson River	Caledonia, N. Y	1,000
	Feb. 18, 1874	Herkimer County, N. Y	Mud or Hydraulic Lake	Hudson River	Caledonia, N. Y	2,000
	Feb. 18, 1874	Herkimer County, N. Y	West Canada Creek	Hudson River	Caledonia, N. Y	1,500
	Feb. 24, 1874		Cayuga Lake	Oswego River	Caledonia, N. Y	6,000
	Feb. 24, 1874	Seneca County, N. Y	Seneca Lake	Hudson River	Caledonia, N. Y	2,000
	Feb. 24, 1874	Chenango County, N. Y	Round Lake	Long Island Sound	Caledonia, N. Y	2,000
	Mar. 2, 1874		Honeoye Falls	Genesee River	Caledonia, N. Y	500
	Mar. 3, 1874	Herkimer County, N. Y	Spruce Creek	Hudson River	Caledonia, N. Y	2,000
	Dec. 9, 1874	Skaneateles, N. Y	Oswego River	Lake Ontario	Caledonia, N. Y	21,000
	Dec. 10, 1874		Fish Creek	Oswego River	Caledonia, N. Y	20,000
	Dec. 11, 1874	Fulton, N. Y	Oswego River	Lake Ontario	Caledonia, N. Y	2,000
	Dec. 15, 1874	Caledonia, N. Y	Caledonia Spring Creek	Genesee River	Caledonia, N. Y	6,750
	Dec. 15, 1874	Monroe County, N. Y	Allen Creek	Genesee River	Caledonia, N. Y	25,000
	Dec. 17, 1874	Orleans County, N. Y	Oak Orchard Creek	Lake Ontario	Caledonia, N. Y	30,000
	Dec. 18, 1874		Oneida Lake	Oswego River	Caledonia, N. Y	20,000
	Dec. 21, 1874	Fort Edward, N. Y	Fortville Creek	Hudson River	Caledonia, N. Y	15,000
	Dec. 21, 1874	Fort Edward, N. Y	Peatwig Creek	Hudson River	Caledonia, N. Y	15,000
	Dec. 21, 1874	Fort Edward, N. Y	Inglesby Creek	Hudson River	Caledonia, N. Y	15,000
	Dec. 22, 1874	Caledonia, N. Y	Caledonia Spring Creek	Genesee River	Caledonia, N. Y	6,750
	Dec. 25, 1874	Orleans County, N. Y	Sandy Creek	Lake Ontario	Caledonia, N. Y	10,000
	Dec. 30, 1874	Sand Bank, N. Y	Beaver Creek	Salmon River	Caledonia, N. Y	10,000

D.—TABLE II.—*Distribution of California salmon from 1873 to 1880, inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Estimated number of fish.
New York—Continued.	Dec. 30, 1874		Mohawk River	Hudson River	Caledonia, N. Y	27,000
	Jan. 2, 1875	Livingston County, N. Y	Conesus Lake	Genesee River	Caledonia, N. Y	10,000
	Jan. 9, 1875	Oneida County, N. Y	Sequoit Creek	Mohawk River	Caledonia, N. Y	8,000
	Jan. 11, 1875		Mohawk River	Hudson River	Caledonia, N. Y	20,000
	Jan. 26, 1875	Caledonia, N. Y	Caledonia Spring Creek	Genesee River	Caledonia, N. Y	6,750
	Feb. 24, 1875	Chautauqua County, N. Y	Chautauqua Lake	Allegany River	Caledonia, N. Y	1,000
	Mar. 2, 1875	Caledonia, N. Y	Caledonia Spring Creek	Genesee River	Caledonia, N. Y	6,750
	Mar. 2, 1875	Skaneateles, N. Y	Oswego River	Lake Ontario	Caledonia, N. Y	3,000
	Mar. 15, 1875	Monroe County, N. Y	Allen Creek	Genesee River	Caledonia, N. Y	25,000
	Jan. —, 1877	Long Island, N. Y	Conetquoit River		New York City Aquarium	14,000
	Jan. —, 1877		Adirondack streams		New York City Aquarium	8,000
	Jan. —, 1877	Roslyn, N. Y			New York City Aquarium	2,000
	Jan. —, 1877	Long Island, N. Y	Great River		New York City Aquarium	2,000
	Jan. —, 1877	Sayville, N. Y	Willow Brook	Hudson River	New York City Aquarium	200
	Jan. —, 1877	Morrisania, N. Y	Creek	Long Island Sound	New York City Aquarium	1,000
	Jan. 7, 1878	Caledonia, N. Y	Caledonia Spring Creek	Genesee River	Caledonia, N. Y	6,000
	Jan. 12, 1878	Wheatland, N. Y	Spring Brook	Lake Ontario	Caledonia, N. Y	4,000
	Jan. 17, 1878	Tompkins County, N. Y	Spring Creek	Cayuga Lake	Caledonia, N. Y	35,000
	Jan. 29, 1878	Oneida County, N. Y	Spring Creek	Mohawk River	Caledonia, N. Y	1,000
	Feb. 8, 1878	Monroe County, N. Y	Walter Creek	Genesee River	Caledonia, N. Y	1,000
	Mar. 11, 1878	Jefferson County, N. Y	Bowell Creek	Black River	Caledonia, N. Y	18,000
	Apr. 11, 1878	Monroe County, N. Y	Spring Creek	Blue Pond	Caledonia, N. Y	35,000
	Apr. 12, 1878	Monroe County, N. Y	Spring Brook	Lake Ontario	Caledonia, N. Y	1,000
	Dec. 5, 1878	Greene County, N. Y	Catskill Creek	Hudson River	Caledonia, N. Y	20,000
	Dec. 31, 1878	Monroe County, N. Y	Spring Creek	Genesee River	Caledonia, N. Y	10,000
	Jan. 15, 1879	Livingston County, N. Y	Spring Creek	Lake Ontario	Caledonia, N. Y	10,000
	Feb. 26, 1879	Ontario County, N. Y	Spring Brook	Hemlock Lake	Caledonia, N. Y	36,000
	Mar. 1, 1879	Cayuga County, N. Y	Spring Brook	Summer Hill Lake	Caledonia, N. Y	9,000
	Mar. 11, 1879	Livingston County, N. Y	Spring Creek	Lake Ontario	Caledonia, N. Y	1,000
North Carolina	Jan. 9, 1877	Third Creek Station, N. C	Yadkin River	Pedee River	Baltimore, Md	5,500
	Jan. 10, 1877	Graham, N. C	Reedy Fork of Haw River	Cape Fear River	Baltimore, Md	8,000
	Jan. 10, 1877	Charlotte, N. C	Catawba River	Santee River	Baltimore, Md	5,000
	Jan. 10, 1877	Raleigh, N. C	Neuse River	Pamlico Sound	Baltimore, Md	10,000
	Dec. 15, 1877	Salisbury, N. C	Yadkin River	Pedee River	Henry's, N. C	60,000
	Dec. 17, 1877	Asheville, N. C	Pigeon River	Tennessee River	Henry's, N. C	10,000
	Dec. 21, 1877	Marion, N. C	Broad River	Santee River	Henry's, N. C	25,000
	Dec. 22, 1877	Buncombe County, N. C	Swannuoa River	French Broad River	Henry's, N. C	27,000
	Jan. 1, 1878	Jamestown, N. C	Deep River	Cape Fear River	Henry's, N. C	15,000
	Jan. 5, 1878	Bridgewater, N. C	Linville River	Catawba River	Henry's, N. C	12,000
	Jan. 8, 1878	Morganton, N. C	Johns River	Catawba River	Henry's, N. C	30,000
	Jan. 9, 1878	Old Fort, N. C	Catawba River	Wateree River	Henry's, N. C	50,000
	Dec. 16, 1878	Patterson's, N. C	Yadkin River	Pedee River	Henry's, N. C	30,000
	Dec. 18, 1878	Patterson's, N. C	Yadkin River	Pedee River	Henry's, N. C	30,000
	Dec. 20, 1878	Hendersonville, N. C	Green River	Broad River	Henry's, N. C	30,000

	Dec. 27, 1878	Jamestown, N. C.	Bull Run Creek	Cape Fear River	Henry's, N. C.	20,000
	Dec. 31, 1878	Jamestown, N. C.	North Fork Deer River	Cape Fear River	Henry's, N. C.	24,500
	Jan. 2, 1879	Friendship, N. C.	North Fork Deep River	Cape Fear River	Henry's, N. C.	18,000
	Jan. 10, 1879	Morganton, N. C.	Johns River and Upper Creek	Catawba River	Henry's, N. C.	30,000
	Jan. 11, 1879	Bridgewater, N. C.	Linville River	Catawba River	Henry's, N. C.	30,000
	Jan. 13, 1879	Danbury, N. C.	Dan River	Roanoke River	Henry's, N. C.	20,000
	Jan. 15, 1879	Hickorynut Gap, N. C.	Broad River		Henry's, N. C.	45,000
	Jan. 18, 1879	Germanton, N. C.	Town Creek	Roanoke River	Henry's, N. C.	20,000
	Dec. 10, 1879	Patterson's, N. C.	Yadkin River	Great Pedee River	Morganton, N. C.	15,000
	Dec. 12, 1879	Morganton, N. C.	Johns River	Catawba River	Morganton, N. C.	10,000
	Dec. 13, 1879	Morganton, N. C.	Linville River	Catawba River	Morganton, N. C.	5,000
	Dec. 15, 1879	Old Fort, N. C.	Catawba River	Wateree River	Morganton, N. C.	5,000
	Dec. 19, 1879	Salisbury, N. C.	Yadkin River	Great Pedee River	Morganton, N. C.	5,000
	Dec. 19, 1879	Newton, N. C.	Clark's Creek	Catawba River	Morganton, N. C.	2,000
	Dec. 25, 1879	Morganton, N. C.	South Fork	Catawba River	Morganton, N. C.	12,000
	Dec. —, 1879	Raleigh, N. C.	Ponds	Neuse River	Morganton, N. C.	200
	Dec. —, 1879		Ponds		Morganton, N. C.	200
	Dec. —, 1880	Morganton, N. C.	Catawba River	Waterce River	Morganton, N. C.	160,000
Ohio	Dec. 10, 1873	Millbrook, Ohio	Muskingum River	Ohio River	Caledonia, N. Y.	20,000
	—— —, 1873	Castalia, Ohio	Castalia Spring		Caledonia, N. Y.	4,000
	Jan. 13, 1874	Bucyrus, Ohio	Sandusky River	Lake Erie	Caledonia, N. Y.	12,000
	Jan. 13, 1874	Eagleville, Ohio	Grand River	Lake Erie	Caledonia, N. Y.	10,000
	Dec. 9, 1874	Monroeville, Ohio	Huron River	Lake Erie	Northville, Mich.	10,000
	Dec. 8, 1875	Wapakoneta, Ohio	Auglaize River	Lake Erie	Northville, Mich.	45,000
	Dec. 8, 1875	Sidney, Ohio	Little Miami River	Ohio River	Northville, Mich.	105,000
	Jan. 1, 1877		Maumee River	Lake Erie	Northville, Mich.	20,000
	May —, 1877	Elmore, Ohio	Portage River	Lake Erie	Northville, Mich.	15,000
	May —, 1877	South Toledo, Ohio	Maumee River	Lake Erie	Northville, Mich.	15,000
	Dec. 10, 1877	Coshocton, Ohio	Walhonding River	Ohio River	Toledo, Ohio	30,000
	Dec. 10, 1877	Coshocton, Ohio	Muskingum River	Ohio River	Toledo, Ohio	15,000
	Dec. 25, 1877	Put-in-Bay, Ohio	Lake Erie	Saint Lawrence River	Toledo, Ohio	40,000
	Dec. 25, 1877	Castalia, Ohio	Cold Creek	Lake Erie	Toledo, Ohio	10,000
	Feb. —, 1878	Columbus, Ohio	Whitstone River	Ohio River	Toledo, Ohio	20,000
	Feb. —, 1878	Newcomerstown, Ohio	Tuscarawas River	Ohio River	Toledo, Ohio	30,000
	Mar. —, 1878	Toledo, Ohio	Maumee Rapids	Lake Erie	Toledo, Ohio	30,000
	Mar. —, 1878	Defiance, Ohio	Maumee River	Lake Erie	Toledo, Ohio	30,000
	Mar. —, 1878	Huron, Ohio	Huron River	Lake Erie	Toledo, Ohio	30,000
	Mar. 10, 1879	Dayton, Ohio	Miami River	Ohio River	Toledo, Ohio	15,000
	Apr. 28, 1879	Geauga County, Ohio	Newberry Pond	Cuyahoga River	Toledo, Ohio	1,000
	May 5, 1879	Mount Vernon, Ohio		Muskingum River	Toledo, Ohio	3,000
	May 6, 1879	Licking County, Ohio	Licking Reservoir	Scioto River	Toledo, Ohio	15,000
	—— —, 1879	Castalia, Ohio	Cold Creek	Lake Erie	Toledo, Ohio	10,000
	Mar. —, 1880	Fremont, Ohio	Sandusky River	Lake Erie	Toledo, Ohio	20,000
	Mar. —, 1880	Waterville, Ohio	Maumee River	Lake Erie	Toledo, Ohio	35,000
	Spring, 1880	Toledo, Ohio	Spring Brook	Lake Erie	Toledo, Ohio	45,000
Pennsylvania	Mar. 1, 1873	Harrisburg, Pa.	Susquehanna River	Chesapeake Bay	Bloomsbury, N. J.	6,000
	Dec. 2, 1873	Mechanicsburg, Pa.	Yellow Breeches Creek	Susquehanna River	Bloomsbury, N. J.	10,000
	Dec. 8, 1873	Chambersburg, Pa	Conecocheague River	Potomac River	Marietta, Pa.	10,000
	Dec. 23, 1873	Upper Paxton, Pa	Mahatonga River	Susquehanna River	Bloomsbury, N. J.	10,000
	Jan. —, 1874	Donegal, Pa	Donegal Springs	Susquehanna River	Bloomsbury, N. J.	10,000
	Jan. 27, 1874	Bellefonte, Pa	Bald Eagle River	Susquehanna River	Bloomsbury, N. J.	15,000
	Jan. 30, 1874	Bellefonte, Pa	Bald Eagle River	Susquehanna River	Bloomsbury, N. J.	15,000

D.—TABLE II.—*Distribution of California salmon from* 1873 *to* 1880, *inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Estimated number of fish.
Pennsylvania—Continued.	Dec. 6, 1874		Conedoquinet Creek	Susquehanna River	Bloomsbury, N. J	6,000
	Dec. 21, 1874	Easton, Pa	Bushkill Creek	Delaware River	Marietta, Pa	60,000
	Dec. 22, 1874	Swatara, Pa	Swatara River	Susquehanna River	Marietta, Pa	30,000
	Dec. 26, 1874	Williams Mill, Pa	Yellow Breeches Creek	Susquehanna River	Marietta, Pa	30,000
	Fall, 1874	Bellefonte, Pa	Spring Creek	Bald Eagle Creek	Bloomsbury, N. J	20,000
	Fall, 1874		Mahatonga River	Susquehanna River	Bloomsbury, N. J	12,000
	Jan. 5, 1875		Buffalo Creek	Susquehanna River	Marietta, Pa	10,000
	Jan. 5, 1875		Pine Creek	Susquehanna River	Marietta, Pa	15,000
	Fall, 1875	Bushkill, Pa	Delaware River	Delaware Bay	Marietta, Pa	60,000
	Fall, 1875	Reading, Pa	Schuylkill River	Delaware River	Marietta, Pa	7,000
	Fall, 1875	Williams Mill, Pa	Yellow Breeches Creek	Susquehanna River	Marietta, Pa	30,000
	Fall, 1875	Lancaster County, Pa	Chiquesalonga Creek	Susquehanna River	Marietta, Pa	15,000
	Fall, 1875	Swatara, Pa	Swatara River	Susquehanna River	Marietta, Pa	30,000
	Fall, 1875	Marietta, Pa	Columbia Dam	Susquehanna River	Marietta, Pa	60,000
	Fall, 1875	Donegal, Pa	Donegal Springs	Susquehanna River	Marietta, Pa	8,000
	Nov. 10, 1875				Baltimore, Md	500
	Spring, 1876	Bushkill, Pa	Bushkill Creek	Delaware River	Marietta, Pa	200,000
	Spring, 1876	Williams Mill, Pa	Yellow Breeches Creek	Susquehanna River	Marietta, Pa	18,000
	Spring, 1876	Marietta, Pa	Susquehanna River	Chesapeake Bay	Marietta, Pa	30,000
	Spring, 1876	Columbia, Pa	Susquehanna River	Chesapeake Bay	Marietta, Pa	50,000
	Spring, 1876		Maiden Run	Susquehanna River	Marietta, Pa	5,000
	Fall, 1876	Brandywine, Pa	Brandywine Creek	Delaware River	Marietta, Pa	15,000
	Fall, 1876	Chickies, Pa	Chiquesalonga Creek	Susquehanna River	Marietta, Pa	30,000
	Fall, 1876	Swatara, Pa	Swatara River	Susquehanna River	Marietta, Pa	50,000
	Fall, 1876		Stony Creek	Spsquehanna River	Marietta, Pa	20,000
	Fall, 1876	Cumberland County, Pa	Conedoquinet Creek	Susquehanna River	Marietta, Pa	20,000
	Fall, 1876	Harrisburg, Pa	Susquehanna River	Chesapeake Bay	Marietta, Pa	20,000
	Fall, 1876	Wilkes Barre, Pa	Bowman's Run	Susquehanna River	Marietta, Pa	50,000
	Fall, 1876		Maiden Creek	Susquehanna River	Marietta, Pa	5,000
	Fall, 1876	Greene County, Pa		Monongahela River	Marietta, Pa	500
	Jan. 6, 1877	Bushkill, Pa		Delaware River	Marietta, Pa	78,000
	Jan. 6, 1877	Lancaster County, Pa	Chiquesalonga Creek	Susquehanna River	Marietta, Pa	32,000
	Jan. 8, 1877	Newville, Pa	Spring Creek	Susquehanna River	Marietta, Pa	22,000
	Jan. 9, 1877	Newport, Pa		Juniata River	Marietta, Pa	20,000
	Jan. 11, 1877	Bushkill, Pa		Delaware River	Marietta, Pa	23,000
	Jan. 22, 1877	Perry County, Pa	Trout Run	Juniata River	Marietta, Pa	22,000
	Jan. 25, 1877	Swatara, Pa	Swatara River	Susquehanna River	Marietta, Pa	25,000
	Apr. 2, 1877	Philadelphia, Pa	Schuylkill River	Delaware River	Marietta, Pa	15,000
	May 11, 1877	Marietta, Pa		Susquehanna River	Marietta, Pa	22,000
	May 12, 1877	Marietta, Pa		Susquehanna River	Marietta, Pa	20,000
	May 12, 1877	Marietta, Pa		Susquehanna River	Marietta, Pa	18,000
	May 14, 1877	Lancaster County, Pa	Chiquesalonga Creek	Susquehanna River	Marietta, Pa	20,000
	Dec. 28, 1877	Snyder County, Pa	Penn's Creek	Susquehanna River	Marietta, Pa	15,000
	Dec. 28, 1877	Chillisquaque, Pa	North Branch	Susquehanna River	Marietta, Pa	10,000

	Jan. 15, 1878	Easton, Pa	Bushkill Creek	Delaware River	Marietta, Pa	20,000
	Jan. 18, 1878	Wilkes Barre, Pa	Bowman's Creek	Susquehanna River	Marietta, Pa	25,000
	Jan. 22, 1878	Easton, Pa	Bushkill Creek	Delaware River	Marietta, Pa	20,000
	Jan. 28, 1878	Westport, Pa	Kettle Creek	Susquehanna River	Marietta, Pa	15,000
	Mar. 22, 1878	Pottstown, Pa		Schuylkill River	Marietta, Pa	4,000
	Dec. 6, 1878	Easton, Pa	Bushkill Creek	Delaware River	Marietta, Pa	22,000
	Dec. 14, 1878	Easton, Pa	Bushkill Creek	Delaware River	Marietta, Pa	25,000
	Dec. 18, 1878	Easton, Pa	Bushkill Creek	Delaware River	Marietta, Pa	25,000
	Dec. 26, 1878	Reading, Pa	Schuylkill River	Delaware River	Marietta, Pa	25,000
	Dec. 28, 1878	William's Mill, Pa	Yellow Breeches Creek	Susquehanna River	Marietta, Pa	25,000
	Jan. 9, 1879	Lewisburg, Pa	Buffalo Creek	Susquehanna River	Marietta, Pa	25,000
	Jan. 11, 1879	Williamsport, Pa	Trout Run	Susquehanna River	Marietta, Pa	25,000
	Jan. 24, 1879	Wilkes Barre, Pa	Bowman's Creek	Susquehanna River	Marietta, Pa	16,000
	Spring, 1879	Cameron County, Pa	Driftwood Brook		Corry, Pa	28,000
	Spring, 1879	Potter County, Pa	Sinnemahoning Creek		Corry, Pa	2,000
	Dec. 9, 1879	Easton, Pa	Bushkill Creek	Delaware River	Marietta, Pa	20,000
	Dec. 11, 1879	Tyrone, Pa	Juniata River	Susquehanna River	Marietta, Pa	18,000
	Dec. 15, 1879	Mifflinburgh, Pa	Penn Creek	Susquehanna River	Marietta, Pa	20,000
	Dec. 17, 1879	Easton, Pa	Bushkill Creek	Delaware River	Marietta, Pa	20,000
	Dec. 19, 1879	William's Mill, Pa	Yellow Breeches Creek	Susquehanna River	Marietta, Pa	18,000
	Feb. 26, 1880	Dallas, Pa	Harvey's Lake	Susquehanna River	Marietta, Pa	8,000
	Feb. 26, 1880	Wilkes Barre, Pa	Bear Lake	Delaware River	Marietta, Pa	8,000
	Mar. 10, 1880	Marietta, Pa	Susquehannah River	Chesapeake Bay	Marietta, Pa	18,000
	Spring, 1880	Cameron County, Pa	Driftwood Brook	Sinnemahoning Creek	Corry, Pa	10,000
	Spring, 1880	Cameron County, Pa	Driftwood Brook	Sinnemahoning Creek	Corry, Pa	62,000
	Spring, 1880	Blair County, Pa	Juniata River	Susquehanna River	Corry, Pa	15,000
Rhode Island	Fall of 1874	Providence County, R. I	Slatersville Branch	Blackstone River	Ponaganset, R. I	12,000
	Fall of 1874	Providence County, R. I	Pawtuxet River	Providence River	Ponaganset, R. I	35,000
	Fall of 1874	Washington County, R. I	Pawcatuck River	Little Narragansett Bay	Ponaganset, R. I	20,000
	Fall of 1874	Washington County, R. I	Artificial ponds	Pawcatuck River	Ponaganset, R. I	1,000
	Fall of 1875	West Greenwich, R. I	Wood River	Pawcatuck River	Ponaganset, R. I	10,000
	Fall of 1875	Washington County, R. I	Pawcatuck River	Little Narragansett Bay	Ponaganset, R. I	10,000
	Fall of 1875	Providence County, R. I	Slatersville Branch	Blackstone River	Ponaganset, R. I	15,000
	Fall of 1875	Providence County, R. I	Pawtuxet River	Providence River	Ponaganset, R. I	80,000
South Carolina	Jan. 10, 1877	Gaffney City, S. C	Broad River	Santee River	Baltimore, Md	5,000
	Jan. 11, 1877	Branchville, S. C	Edisto River		Baltimore, Md	4,000
	Jan. 11, 1877	Charleston, S. C	Cooper River	Charleston Bay	Baltimore, Md	2,000
	Dec. 28, 1878	Seneca, S. C	Seneca River	Savannah River	Baltimore, Md	4,000
	Jan. 7, 1879	Charlotte, N. C	Catawba River	Wateree River	Baltimore, Md	1,500
	Jan. 7, 1879	Columbia, S. C	Broad River	Santee River	Baltimore, Md	4,500
	Jan. 7, 1879	Spartanburg C. H., S. C	Packlette River	Broad River	Baltimore, Md	4,500
	Jan. 7, 1879	Greenville C. H., S. C	Saluda River	Santee River	Baltimore, Md	4,500
	Jan. 7, 1879	Orangeburg C. H., S. C	Edisto River		Baltimore, Md	5,000
	Jan. 8, 1879	Charleston County, S. C	Cooper River	Charleston Bay	Baltimore, Md	5,000
	1879		Enoree River	Broad River	Morganton, N. C	5,000
	1879		Saluda River	Santee River	Morganton, N. C	3,000
	1879		Seneca River	Savannah River	Morganton, N. C	3,000
	1879		Mossy Creek	Broad River	Morganton, N. C	3,000
	1879		Little River	Savannah River	Morganton, N. C	2,000
	1879		Martinus Creek	Savannah River	Morganton, N. C	3,000
	1879		Tugaloo River	Savannah River	Morganton, N. C	5,000
	1879		Pedee River		Morganton, N. C	7,000

D.—TABLE II.—*Distribution of California salmon from* 1873 *to* 1880, *inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Estimated number of fish.
South Carolina—Continued.	Spring, 1880		Enoree River	Broad River	Morganton, N. C	5,000
	Spring, 1880	Greenville C. H., S. C	Saluda River	Santee River	Morganton, N. C	3,000
	Spring, 1880	Seneca, S. C	Seneca River	Savannah River	Morganton, N. C	3,000
	Spring, 1880		Mossy Creek	Broad River	Morganton, N. C	3,000
	Spring, 1880		Little River	Broad River	Morganton, N. C	2,000
	Spring, 1880		Martinus Creek	Savannah River	Morganton, N. C	3,000
	Spring, 1880		Tugaloo River	Savannah River	Morganton, N. C	5,000
	Spring, 1880		Pedee River		Morganton, N. C	7,000
	1880		Broad River	Santee River	Morganton, N. C	25,000
	1880	Seneca, S. C	Seneca River	Savannah River	Morganton, N. C	25,000
	1880		Wateree River	Santee River	Morganton, N. C	30,000
	1880		Saluda River	Santee River	Morganton, N. C	25,000
	1880		Edisto River		Morganton, N. C	20,000
	1880		Black River	Pedee River	Morganton, N. C	20,000
	1880		Three Runs	Savannah River	Morganton, N. C	12,000
Tennessee	Dec. 25, 1875	Memphis, Tenn	Wolf River	Mississippi River	Northville, Mich	40,000
	Dec. 10, 1876	Humboldt, Tenn	Forked Deer River	Mississippi River	Northville, Mich	2,200
	Dec. 10, 1876	Jackson, Tenn	Forked Deer River	Mississippi River	Northville, Mich	12,400
	Dec. 22, 1876	Chuck Creek, Tenn	French Broad River	Tennessee River	Baltimore, Md	5,000
	Dec. 22, 1876	Athens, Tenn	Eastanallee River	Tennessee River	Baltimore, Md	5,000
	Dec. 25, 1876	Jackson, Tenn	Forked Deer River	Mississippi River	Northville, Mich	12,400
Texas	Dec. —, 1874	Hempstead, Tex	Clear Creek	Brazos River	Niles, Mich	2,000
	Dec. —, 1874	Austin, Tex		Colorado River	Niles, Mich	12,000
	1873–1875		Streams		Niles, Mich	180,000
	Dec. 10, 1876	Hempstead, Tex	Clear Creek	Brazos River	Northville, Mich	2,000
	Dec. 11, 1876	Austin, Tex		Colorado River	Northville, Mich	18,000
Utah	Aug. —, 1873	Jordan, Utah	Jordan River	Great Salt Lake	Jordan, Utah	32,000
	Oct. —, 1874	Jordan, Utah	Jordan River	Great Salt Lake	Jordan, Utah	195,900
	Nov. —, 1875	Jordan, Utah	Jordan River	Great Salt Lake	Jordan, Utah	112,000
	Fall of 1876	Weber County, Utah	Ogden River	Great Salt Lake	Jordan, Utah	1,750
	Fall of 1876	Weber County, Utah	Weber River	Great Salt Lake	Jordan, Utah	1,750
	Fall of 1876	Cache County, Utah	Blacksmith's Fork	Lower Bear River	Jordan, Utah	8,000
	Fall of 1876	Box Elder County, Utah	Box Elder Creek		Jordan, Utah	4,000
	Fall of 1876	Tooele County, Utah	Twin Spring Creek		Jordan, Utah	2,500
	Fall of 1876	Rich County, Utah	Upper Bear River	Great Salt Lake	Jordan, Utah	11,000
	Fall of 1875	Juab County, Utah	Silver Creek		Jordan, Utah	4,000
	Fall of 1876	Davis County, Utah	Jenning's Pond	Great Salt Lake	Jordan, Utah	1,200
	Fall of 1877	Davis County, Utah	Jenning's Pond	Great Salt Lake	Jordan, Utah	2,000
	Fall of 1877	Utah County, Utah	Mill Creek	Jordan River	Jordan, Utah	16,000
	Fall of 1877	Jordan, Utah	Jordan River	Great Salt Lake	Jordan, Utah	57,000
	Spring, 1879	White's Bridge, Utah	Jordan River	Great Salt Lake	Jordan, Utah	32,000
	Spring, 1879	Forrest Farm, Utah	Spring Creek	Jordan River	Jordan, Utah	2,500
	Spring, 1879	Tooele County, Utah	Twin Spring Creek		Jordan, Utah	4,000
	Spring, 1879	Sanpete County, Utah	San Pitch River	Sevier River	Jordan, Utah	1,500
	Spring, 1879	Salt Lake County, Utah	Mill Creek	Jordan River	Jordan, Utah	4,000

	Spring, 1879	Mill Creek, Utah	Mill Creek	Jordan River	Jordan, Utah	3,000
	Spring, 1879	Jordan, Utah	Jordan River	Great Salt Lake	Jordan, Utah	7,000
Vermont	Sept. 29, 1873	Highgate, Vt	Kelly Brook	Lake Champlain	Bucksport, Me	10,000
	Dec. 22, 1873	Swanton, Vt	Missisquoi River	Lake Champlain	Bucksport, Me	15,000
	Dec. 27, 1873	Highgate, Vt	Hubbleford Brook	Missisquoi River	Bucksport, Me	5,000
	Dec. 27, 1873	Highgate, Vt	Missisquoi River	Lake Champlain	Bucksport, Me	10,000
Virginia	Jan. —, 1874	Winchester, Va	Cedar Creek	Potomac River	Bloomsbury, N. J	30,000
	Fall, 1874	Lynchburg, Va	James River	Chesapeake Bay	Lynchburgh, Va	25,000
	1874			James River	Bloomsbury, N. J	5,000
	Dec. 22, 1874	Salem, Va		Roanoke River	Bloomsbury, N. J	5,000
	Dec. 22, 1874	Central, Va	New River	Great Kanawha River	Bloomsbury, N. J	10,000
				Rappahannock River	Bloomsbury, N. J	10,000
	Jan. —, 1876	Nelson County, Va	Tye River	James River	Lexington, Va	17,000
	Jan. —, 1876	Amherst County, Va	Pedlar River	James River	Lexington, Va	10,000
	Jan. —, 1876	Alleghany County, Va	Jackson River	James River	Lexington, Va	15,000
	Jan. —, 1876	Giles County, Va	Mountain Lake	James River	Lexington, Va	3,000
	Jan. —, 1876	Botetourt County, Va	Tributaries of	James River	Lexington, Va	37,500
	Jan. —, 1876	Rockbridge County, Va	Tributaries of	James River	Lexington, Va	37,500
	Jan. —, 1876		Tributaries of	Roanoke River	Blacksburgh, Va	40,000
	Dec. 4, 1876	Strasburg, Va	Cedar Creek	Shenandoah River	Baltimore, Md	9,600
	Dec. 4, 1876	Strasburg, Va	North Fork	Shenandoah River	Baltimore, Md	29,600
	Dec. 4, 1876	Mount Jackson, Va	North Fork	Shenandoah River	Baltimore, Md	39,200
	Dec. 13, 1876	Rectortown, Va	Goose River	Potomac River	Baltimore, Md	40,000
	Dec. 13, 1876	Broad Run Station, Va	Broad Run	Occoquan Falls	Baltimore, Md	20,000
	Dec. 21, 1876	Big Spring Depot, Va	Staunton River	Roanoke River	Baltimore, Md	10,000
	1878	Lexington, Va	North River	James River	Lexington, Va	92,000
	Nov. 1, 1878	Kerr's Creek, Va	North River	James River	Lexington, Va	30,000
	Nov. 23, 1878	Buffalo Mills, Va	Buffalo Creek	James River	Lexington, Va	25,000
	Nov. 23, 1878	Lexington, Va	South River	James River	Lexington, Va	25,000
	Nov. 29, 1878	Greenville, Va	South River	Shenandoah River	Lexington, Va	65,000
	Dec. 30, 1878	Lynchburgh, Va	James River	Chesapeake Bay	Lexington, Va	60,000
	Dec. 30, 1878	Rapid Ann Station, Va	Rapidan River	Rappahannock River	Lexington, Va	40,000
	Jan. 16, 1879	Rapid Ann Station, Va	Rapidan River	Rappahannock River	Lexington, Va	20,000
	Feb. 20, 1879	Richmond, Va	New Reservoir	James River	Lexington, Va	1,000
	Feb. 24, 1879	Botetourt County, Va	Streams	James River	Lexington, Va	5,000
	Mar. 27, 1879	Kerr's Creek, Va	North River	James River	Lexington, Va	5,000
	Dec. 16, 1879	Wythe County, Va	Totes Run	New River	Wytheville, Va	20,000
	Dec. 19, 1879	Wythe County, Va	Totes Run	New River	Wytheville, Va	20,000
	Dec. 22, 1879	Wythe County, Va	Reed Creek	New River	Wytheville, Va	40,000
	Jan. 1, 1880	Atkin's Tank, Va	Middle Fork of Holston River	Tennessee River	Wytheville, Va	40,000
	Jan. 2, 1880	Sharon Springs, Va	North Fork of Holston River	Tennessee River	Wytheville, Va	50,000
	Jan. 5, 1880	Burnt Bridge, Va	North River	James River	Lexington, Va	12,500
	Jan. 5, 1880	Collierstown, Va	Collier's Creek	James River	Lexington, Va	16,000
	Jan. 5, 1880	Lexington, Va	South River	James River	Lexington, Va	16,000
	Jan. 5, 1880	Monmouth, Va	Kerr's Creek	James River	Lexington, Va	16,000
	Jan. 8, 1880	Big Spring Depot, Va	South Fork of Staunton River	Roanoke River	Wytheville, Va	38,000
	Jan. 13, 1880	Alone, Va	Buffalo Creek	James River	Lexington, Va	25,000
	Jan. 14, 1880	Montgomery White Sulphur Springs, Va.	Staunton River	Roanoke River	Wytheville, Va	20,000
	Jan. 14, 1880	Salem, Va	Staunton River	Roanoke River	Wytheville, Va	20,000
	Jan. 19, 1880	Alleghany Springs, Va	Staunton River	Roanoke River	Wytheville, Va	8,000
	Jan. 21, 1880	Prospect, Va	Appomattox River	James River	Wytheville, Va	30,000

D.—TABLE II.—*Distribution of California salmon from* 1873 *to* 1880, *inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Estimated number of fish.
Virginia—Cont'd ..	Jan. 31, 1880	Wytheville, Va	Totes Run	New River	Wytheville, Va	2,000
West Virginia	Jan. —, 1874	Romney, W. Va	South Fork	Potomac River	Bloomsbury, N. J	15,000
	Dec. 31, 1875	Sir John's Run, W. Va	Potomac River	Chesapeake Bay	Baltimore, Md	15,000
	Dec. 27, 1876	Keyser, W. Va	Potomac River	Chesapeake Bay	Baltimore, Md	25,000
	Dec. 28, 1876	Clarksburgh, W. Va	West Fork	Monongahela River	Baltimore, Md	8,000
	Feb. 1, 1877	Cherry Run Depot, W. Va	Cherry Run	Potomac River		14,000
	Nov. 22, 1877	Piedmont, W. Va	Potomac River	Chesapeake Bay		15,000
	Dec. —, 1877	Wheeling, W. Va				10,000
	Dec. 5, 1877	Sir John's Run, W. Va	Potomac River	Chesapeake Bay		25,000
	Dec. 7, 1877	West Union, W. Va	Middle Island Creek	Ohio River	Wheeling, W. Va	3,300
	Dec. 7, 1877	Littleton, W. Va	Fish Creek	Ohio River	Wheeling, W. Va	3,300
	Dec. 7, 1877	Wheeling, W. Va	Wheeling Creek	Ohio River	Wheeling, W. Va	3,275
	Mar. 22, 1878	Sir John's Run, W. Va	Potomac River	Chesapeake Bay		12,000
	Mar. 26, 1878	Keyser, W. Va	Potomac River	Chesapeake Bay		20,000
	Nov. —, 1878	West Union, W. Va	Middle Island Creek	Ohio River	Wheeling, W. Va	25,000
	Nov. —, 1878	Pennsborough, W. Va	Hugh's River	Ohio River	Wheeling, W. Va	25,000
	Nov. —, 1878	Wakersville, W. Va	West Fork Monongahela River	Ohio River	Wheeling, W. Va	25,000
	Nov. —, 1878	Erving's Mill, W. Va	Little Kanawha River	Ohio River	Wheeling, W. Va	25,000
	Nov. 9, 1878	Ronceverte, W. Va	Greenbrier River	Ohio River	Wheeling, W. Va	63,000
	Nov. 9, 1878	Caldwell, W. Va	Greenbrier River	Ohio River	Wheeling, W. Va	88,000
	Nov. —, 1878	Lewisburgh, W. Va	Sinking Creek	Ohio River	Wheeling, W. Va	2,000
	Nov. —, 1878	Charleston, W. Va	Kanawha River	Ohio River	Wheeling, W. Va	60,000
	Nov. —, 1878			Potomac River		40,000
	Dec. 4, 1878			Potomac River	Baltimore, Md	20,000
	Dec. —, 1878	Mannington, W. Va	Fishing Creek	Ohio River	Wheeling, W. Va	37,500
	Dec. 4, 1878	Littleton, W. Va	Fish Creek	Ohio River	Wheeling, W. Va	37,500
	Dec. —, 1878	Cold Spring, W. Va	Wheeling Creek	Ohio River	Wheeling, W. Va	25,000
	Dec. —, 1878	Bethany, W. Va	Buffalo Creek	Ohio River	Wheeling, W. Va	25,000
	Dec. —, 1878	Fairview, W. Va	King's Creek	Ohio River	Wheeling, W. Va	25,000
	Dec. 10, 1879	Harper's Ferry, W. Va	Potomac River	Chesapeake Bay	Druid Hill, Md	15,000
	Jan. 1, 1880	Keyser, W. Va	Potomac River	Chesapeake Bay	Druid Hill, Md	8,000
	1879–1880	Burton, W. Va	Fish Creek	Ohio River	Wheeling, W. Va	20,000
	1879–1880	Bethany, W. Va	Buffalo Creek	Ohio River	Wheeling, W. Va	20,000
	1879–1880	Parkersburgh, W. Va		Ohio River	Wheeling, W. Va	5,000
	1879–1880	Littleton, W. Va	Fish Creek	Ohio River	Wheeling, W. Va	25,000
	1879–1880	Bellton, W. Va	Fish Creek	Ohio River	Wheeling, W. Va	40,000
	1879–1880	Hampshire County, W. Va	Tributaries of	Potomac River	Wheeling, W. Va	19,500
	1879–1880	Grant County, W. Va	Luney's Creek		Wheeling, W. Va	20,000
	1879–1880	Grant County, W. Va	William's Ponds		Wheeling, W. Va	3,500
	1879–1880	Barbour County, W. Va	Tygart's Valley River		Wheeling, W. Va	5,000
	1879–1880	Randolph County, W. Va	Tygart's Valley River		Wheeling, W. Va	5,000
	1879–1880	Marion County, W. Va			Wheeling, W. Va	2,000
	1879–1880	Mineral County, W. Va		Potomac River	Wheeling, W. Va	500
	1879–1880	Jefferson County, W. Va		Potomac River	Wheeling, W. Va	1,000
	1879–1880	Hampshire County, W. Va		Potomac River	Wheeling, W. Va	800

	1879–1880	Hampshire County, W. Va.		Potomac River	Wheeling, W. Va.	200
	1879–1880		Greenbrier River	Kanawha River	Wheeling, W. Va.	10,000
	1879–1880	Ronceverte, W. Va.	Greenbrier River	Kanawha River	Wheeling, W. Va.	12,000
	1879–1880	Hinton, W. Va.	New River	Ohio River	Wheeling, W. Va.	10,000
	1879–1880	Charleston, W. Va.	Elk River	Kanawha River	Wheeling, W. Va.	10,000
Wisconsin	1874	Grant County, Wis.	Streams	Mississippi River	Boscobel, Wis.	6,000
	1874	Crawford County, Wis.	Streams	Mississippi River	Boscobel, Wis.	6,000
	1874	La Fayette County, Wis.	Streams	Mississippi River	Boscobel, Wis.	7,000
	Dec. —, 1874	Green Lake County, Wis.	Green Lake		Boscobel, Wis.	10,000
	1875	Walworth, Wis.	Geneva Lake	White River	Geneva Lake, Wis.	25,000
	Jan. 17, 1876		Tributaries	Mississippi River	Boscobel, Wis.	22,000
	1876	Walworth, Wis.	Geneva Lake	White River	Geneva Lake, Wis.	60,000
	Jan. 17, 1877	Geneva, Wis.	Geneva Lake	White River	Geneva Lake, Wis.	15,000
	1877	Sauk County, Wis.	Spirit Lake	Wisconsin River	Madison, Wis.	10,000
	1877	Walworth County, Wis.	Geneva Lake	White River	Madison, Wis.	15,000
	1877	Waushara County, Wis.	Wautoma Lake	Fox River	Madison, Wis.	6,000
	1877	Waukesha County, Wis.	Oconomowoc Lake	Oconomowoc Creek	Madison, Wis.	4,800
	1877	Dane County, Wis.	Mendota Lake	Catfish River	Madison, Wis.	15,800
	1877	Ravine County, Wis.	Brown's Lake	Lake Michigan	Madison, Wis.	2,400
	1877	Chippewa County, Wis.	Three-Mile Lake	Chippewa River	Madison, Wis.	8,500
	1877	Madison, Wis.	Pond at hatching	Catfish River	Madison, Wis.	8,000
	1877	Richland Centre, Wis.	Pine River	Wisconsin River	Madison, Wis.	2,000
	Oct. 5, 1877	Boscobel, Wis.	Streams	Wisconsin River	Madison, Wis.	6,000
	Oct. 18, 1877	Madison, Wis.	Mendota Lake	Catfish River	Madison, Wis.	6,000
	Jan. 18, 1878	Madison, Wis.	Creek	Mendota Lake	Madison, Wis.	50
	Mar. 22, 1878	Lodi, Wis.	Spring Creek	Wisconsin River	Madison, Wis.	15,000
	Mar. 23, 1878	Poynette, Wis.		Wisconsin River	Madison, Wis.	15,000
	Mar. 24, 1878	Hartman, Wis.		Wisconsin River	Madison, Wis.	12,000
	Apr. 4, 1878	Boscobel, Wis.	Streams	Wisconsin River		600
	Apr. 27, 1878	Walworth County, Wis.	Perch Lake		Madison, Wis.	5,000
	Apr. 29, 1878	Walworth County, Wis.	Boothe's Creek		Madison, Wis.	10,000
	June 13, 1878	Portage, Wis.	Silver Lake	Wisconsin River	Madison, Wis.	150
	June 13, 1878	Portage, Wis.	Wisconsin River	Mississippi River	Madison, Wis.	8,000
	1878	Walworth County, Wis.	Geneva Lake	White River	Geneva Lake, Wis.	200,000
	1879	Tunnel City, Wis.	Lemonweir River	Wisconsin River	Madison, Wis.	4,000
	1879	Richfield, Wis.	Cedar Creek	Milwaukee River	Madison, Wis.	5,000
	1879	Brodhead, Wis.	Sugar River	Rock River	Madison, Wis.	10,000
	1879	Tomah, Wis.	Lemonweir River	Wisconsin River	Madison, Wis.	2,100
	1879		Ponds (Mr. Labar's)		Madison, Wis.	1,000
	1879	Clear Lake, Wis.	Willow River	Mississippi River	Madison, Wis.	1,500
	1879	Tunnel City, Wis.	Lemonweir River	Wisconsin River	Madison, Wis.	60
	1879	Sparta, Wis.	La Crosse River	Mississippi River	Madison, Wis.	15,000
	1879		(D. Anthony)		Madison, Wis.	1,000
	1879		Mr. Soverance		Madison, Wis.	1,000
	1879		Fish Lake	Red Cedar River	Madison, Wis.	250
	1879		Pond (D. Sykes)		Madison, Wis.	800
	1879		Nagawica Lake	Menomonee River	Madison, Wis.	1,500
	1879	Racine County, Wis.	Brown's Lake		Madison, Wis.	5,000
	1879		Nine Springs Creek		Madison, Wis.	3,000
	1879	Walworth County, Wis.	Geneva Lake	White River	Madison, Wis.	200,000
	Dec. 15, 1880	Geneva, Wis.	Creek	Geneva Lake	Madison, Wis.	90,000

D.—TABLE III.—*Distribution of Schoodic salmon from* 1874 *to* 1880, *inclusive.*

State.	Date.	Locality.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Number of fish.
California	1878	Nevada County, Cal	Donner Lake	Truckee River	San Leandro, Cal	5,000
	1878	Placer County, Cal	Sereno Lake		San Leandro, Cal	5,000
	1878	San Mateo County, Cal	Felch's Lake		San Leandro, Cal	5,000
	1878	Monterey County, Cal	Espinoza Lake		San Leandro, Cal	5,000
	1878	San Francisco, Cal	Woodward Aquarium		San Leandro, Cal	500
	1878	Tulare County, Cal	Tulare Lake		San Leandro, Cal	15,000
	1878	Alameda County, Cal	Lake Chabot		San Leandro, Cal	2,500
	1878	Alameda County, Cal	Arroyo Laguna		San Leandro, Cal	700
	1878	San Francisco County, Cal	Laguna Honda		San Leandro, Cal	1,000
	1878	El Dorado County, Cal	Echo Lake		San Leandro, Cal	250
Connecticut	1876	South Kent, Conn	Spectacle Pond		Westport and Waltonia, Conn	10,000
	1876	Winsted, Conn	Long Lake		Westport and Waltonia, Conn	10,000
	1876	Chapinville, Conn	Twin Lakes		Westport and Waltonia, Conn	10,000
	1876	Lakeville, Conn	Wononscoponuc Lake		Westport and Waltonia, Conn	10,000
	1876	Norfolk, Conn	Smith Pond		Westport and Waltonia, Conn	10,000
	1876	Warren, Conn	Waramang Lake		Westport and Waltonia, Conn	10,000
	1876	Litchfield, Conn	Bantam Lake		Westport and Waltonia, Conn	15,000
	1876	Voluntown, Conn	Beach Pond		Westport and Waltonia, Conn	10,000
	1876	East Hampton, Conn	Hampton Pond		Westport and Waltonia, Conn	10,000
	1876	Rockville, Conn	Snipsic Lake		Westport and Waltonia, Conn	10,000
	1876	Lyme, Conn	Rogers Lake		Westport and Waltonia, Conn	10,000
	1876	Windham, Conn	Shetucket Waters		Westport and Waltonia, Conn	10,000
	1876	Salem, Conn	Gardiner's Lake		Westport and Waltonia, Conn	10,000
	1877	New Preston, Conn	Waramang Lake		Westport and Waltonia, Conn	5,000
	1877	Litchfield, Conn	Bantam Lake		Westport and Waltonia, Conn	5,000
	1877	Lyme, Conn	Hog Lake		Westport and Waltonia, Conn	5,000
	1877	Salem, Conn	Gardiner's Lake		Westport and Waltonia, Conn	5,000
	1877	Salisbury, Conn	Twin Lakes		Westport and Waltonia, Conn	5,000
	1877	Lakeville, Conn	Wononscoponuc Lake		Westport and Waltonia, Conn	5,000
	1877	Kent, Conn	Spectacle Ponds		Westport and Waltonia, Conn	5,000
	1877	Rockville, Conn	Snipsic Lake		Westport and Waltonia, Conn	5,000
	1877	East Hampton, Conn	Hampton Pond		Westport and Waltonia, Conn	5,000
	1877	Winsted, Conn	Long Lake		Westport and Waltonia, Conn	5,000
	1877	South Coventry, Conn	Wangumbourg Pond		Westport and Waltonia, Conn	5,000
	1877	South Windham, Conn	Balahack Brook		Westport and Waltonia, Conn	5,000
	1877	East Haven, Conn	Saltonstall Lake		Westport and Waltonia, Conn	1,000
	1877	Branford, Conn	Roger's Pond		Westport and Waltonia, Conn	1,000
	1877	Woodbridge, Conn	Valley Pond		Westport and Waltonia, Conn	500
	1878	Salisbury, Conn	Twin Lakes		North Branford, Conn	10,000
	1878	Kent, Conn	Spectacle Ponds		North Branford, Conn	10,000
	1878	Sherman, Conn	Square Pond		North Branford, Conn	5,000
	1878	Sherman, Conn	Green Pond		North Branford, Conn	5,000
	1878	Salem, Conn	Gardiner's Lake		North Branford, Conn	10,000
	1878	Lyme, Conn	Hog Lake		North Branford, Conn	10,000

	1878	Rockville, Conn	Snipsic Lake		North Branford, Conn	10,000
	1878	East Hampton, Conn	Hampton Pond		North Branford, Conn	10,000
	1878	Litchfield, Conn	Bantam Lake		North Branford, Conn	10,000
	1878	South Coventry, Conn	Wauramang Lake		North Branford, Conn	10,000
	1878	West Winsted, Conn	Long Lake		North Branford, Conn	10,000
	1878	Stafford Springs, Conn	Stafford Springs Reservoir		North Branford, Conn	10,000
	1878	Thompsonville, Conn	Brooks	Connecticut River	North Branford, Conn	10,000
	1878	Lyme, Conn	Rogers Lake		North Branford, Conn	15,000
	1878	Willimantic, Conn	Brooks	Thames River	North Branford, Conn	15,000
	1878	New Haven, Conn	Salterstall Lake		North Branford, Conn	10,000
	1878	Woodbridge, Conn	Valley Pond		North Branford, Conn	5,000
	1879	Ridgefield, Conn	Round Pond	Housatonic River	Westport, Conn	10,000
	1879	Danbury, Conn	Lake Kenosha	Housatonic River	Westport, Conn	10,000
	1879	Chapinville, Conn	Twin Lakes	Housatonic River	Westport, Conn	5,000
	1879	Sherman, Conn	Green Pond	Housatonic River	Westport, Conn	5,000
	1879	Lakeville, Conn	Wonoscoponuc Lake	Housatonic River	Westport, Conn	5,000
	1879	Stafford Springs, Conn	Stafford Springs Reservoir	Thames River	Westport, Conn	10,000
	1879	West Winsted, Conn	Long Lake	Naugatuck River	Westport, Conn	10,000
	1879	East Haven, Conn	Saltonstall Lake		Westport, Conn	10,000
	1879	Lyme, Conn	Hog Lake	Connecticut River	Westport, Conn	10,000
	1879	Salem, Conn	Gardiner's Lake	Thames River	Westport, Conn	10,000
	1879	Newtown, Conn	Tributary	Housatonic River	Westport, Conn	10,000
	1879	New Preston, Conn	Waramaug Lake	Housatonic River	Westport, Conn	10,000
	1879	Litchfield, Conn	Bantam Lake	Housatonic River	Westport, Conn	10,000
	1879	East Hampton, Conn	Lake Pocatapang	Connecticut River	Westport, Conn	10,000
	1879	Willimantic, Conn	Tributaries	Thames River	Westport, Conn	10,000
	1879	South Coventry, Conn	Wangabonig Lake	Thames River	Westport, Conn	10,000
	1879	West Hartford, Conn	Reservoir	Connecticut River	Westport, Conn	3,715
	1879	Melrose, Conn	Melrose Pond	Connecticut River	Westport, Conn	10,000
	1879	Rockville, Conn	Snipsic Lake	Connecticut River	Westport, Conn	10,000
	1879	Southport, Conn	Southport Pond	Mill River	Westport, Conn	10,000
	1880	Durham, Conn	Pitsquog Pond	Connecticut River	Poquonock, Conn	5,000
	1880	Higganum, Conn	Higganum Reservoir	Connecticut River	Poquonock, Conn	5,000
	1880	Lyme, Conn	Rogers Lake	Long Island Sound	Poquonock, Conn	5,000
	1880	Guilford, Conn	Limepaug Lake	Long Island Sound	Poquonock, Conn	5,000
	1880	Sandy Hook, Conn	Halfway River	Housatonic River	Poquonock, Conn	5,000
	1880	Falls Village, Conn	Tanum Mountain Pond	Housatonic River	Poquonock, Conn	5,000
	1880	Danbury, Conn	Kanesiac Pond	Housatonic River	Poquonock, Conn	5,000
	1880	Brookfield, Conn	Still River	Housatonic River	Poquonock, Conn	5,000
	1880	Woodbury, Conn	Pomerang River	Naugatuck River	Poquonock, Conn	5,000
	1880	Southport, Conn	Perry's Pond	Long Island Sound	Poquonock, Conn	5,000
	1880	Mianus, Conn	Mianus River	Long Island Sound	Poquonock, Conn	5,000
	1880	Middlebury, Conn	Quasepaug Lake	Naugatuck River	Poquonock, Conn	5,000
	1880	Plainville, Conn	Plainville Reservoir	Farmington River	Poquonock, Conn	5,000
	1880	Meriden, Conn	Black Pond	Quinipiac River	Poquonock, Conn	5,000
	1880	Bolton, Conn	Bolton Reservoir	Hockanum River	Poquonock, Conn	5,000
	1880	Windsor, Conn	Scantic River	Connecticut River	Poquonock, Conn	5,000
	1880	Broad Brook, Conn	Broad Brook	Connecticut River	Poquonock, Conn	5,000
	1880	Granby, Conn	Salmon River	Farmington River	Poquonock, Conn	5,000
	1880	Hartford, Conn	Colt's Reservoir		Poquonock, Conn	1,000
Illinois	1878	Richmond, Ill	Twin Lakes		Elgin, Ill	4,000
	1878	Elgin, Ill	Pond		Elgin, Ill	200

D.—TABLE III.—*Distribution of Schoodic salmon from* 1874 *to* 1880, *inclusive*—Continued.

State.	Date.	Locality.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Number of fish.
Illinois—Continued	1878	Trenton, Ill	Pond		Elgin, Ill	200
Indiana	1878				Pokagon, Mich	25,000
	1880	La Porte, Ind	Stony Lake		Pokagon, Mich	10,000
Iowa	1878	De Witt, Clinton County, Iowa	Silver Creek		Anamosa, Iowa	3,000
	1878	Clear Lake, Cerro Gordo County, Iowa.	Clear Lake		Anamosa, Iowa	3,000
	1878	Cedar Rapids, Iowa	Cedar River		Anamosa, Iowa	3,000
	1878	Tama City, Iowa	Iowa River		Anamosa, Iowa	3,000
	1878	Boone, Iowa	Des Moines River		Anamosa, Iowa	3,000
	1878	Anamosa, Iowa	Hatching ponds		Anamosa, Iowa	5,000
Kansas	1879	Ellsworth County, Kans	Smoky Hill River	Kansas River	Ellsworth, Kans	10,000
	1879	McPherson County, Kans	Inman Lake		Ellsworth, Kans	10,000
	1880	Fort Harker, Kans	Howard's Lake	Smoky Hill River	Ellsworth, Kans	1,000
	1880	Wilson, Kans	Pond	Smoky Hill River	Ellsworth, Kans	600
	1880	Ellsworth, Kans	Pond	Smoky Hill River	Ellsworth, Kans	200
	1880	Venango, Kans	Pond	Smoky Hill River	Ellsworth, Kans	500
	1880	Bluffville, Kans	Bluff Creek	Smoky Hill River	Ellsworth, Kans	500
	1880	Trivoli, Kans	Bradley Spring	Smoky Hill River	Ellsworth, Kans	500
	1880	Farisville, Kans	Elm Creek	Smoky Hill River	Ellsworth, Kans	500
	1880	Farisville, Kans	Clear Creek	Smoky Hill River	Ellsworth, Kans	500
	1880	Farisville, Kans	Clear Creek	Smoky Hill River	Ellsworth, Kans	500
	1880	Trivoli, Kans	Spring Creek	Smoky Hill River	Ellsworth, Kans	500
	1880	Ellsworth, Kans	Ash Creek	Smoky Hill River	Ellsworth, Kans	1,000
	1880	Fort Harker, Kans	Spring Creek	Smoky Hill River	Ellsworth, Kans	3,000
Kentucky	1878	Taylorsville, Ky	Asher's Creek	Salt River	Louisville, Ky	1,000
	1878	Somerset, Ky	Pitman Creek	Cumberland River	Louisville, Ky	1,000
	1878	Smith's Grove, Ky	Pond		Louisville, Ky	500
	1878	Versailles, Ky	Pond		Louisville, Ky	500
	1878	Elizabethtown, Ky	Nolin Creek	Green River	Louisville, Ky	1,000
	1878	Covington, Ky	Glasser's Lake		Louisville, Ky	500
	1878	Vanceburgh, Ky	Kinniconick Creek	Ohio River	Louisville, Ky	1,000
Maine	1874		Kennebago Stream			2,000
	1876		Grand Lake	Saint Croix Stream		250,000
	1877		Grand Lake	Saint Croix Stream		110,000
	1878	Charlotte, Me	Moosehorn Waters	Pemaquan River	Pembroke, Me	15,000
	1878	Charlotte, Me	Sprague's Pond	Pemaquan River	Pembroke, Me	5,000
	1878	Cooper, Me	Cathance Lake	Denny's River	Pembroke, Me	10,000
	1878	Charlotte, Me	Crocker's Lake	Pemaquan River	Pembroke, Me	5,000
	1878	Aroostook County, Me	Drew's Lake	Meduxnekeag River	Houlton, Me	3,000
	1878	Aroostook County, Me	Limerick Lake	Meduxnekeag River	Houlton, Me	2,000
	1878	Enfield, Me	Cold Spring Pond	Penobscot River	Bucksport, Me	5,000
	1878	Newport, Me	Newport Pond	Kennebec River	Bucksport, Me	4,000
	1878	Washington County, Me	Grand Lake	Saint Croix River	Bucksport, Me	437,000
	1878	Calais, Me	Keene's Lake	Saint Croix River	Grand Lake Stream, Me	10,000

	1879	Mount Kineo, Me	Moosehead Lake	Kennebec River	Bucksport, Me	20,000
	1879	Damariscotta, Me	Pond		Bucksport, Me	5,000
	1879	Unity, Me	Pond		Bucksport, Me	5,000
	1879	Auburn, Me	Pond		Bucksport, Me	5,000
	1879	Dexter, Me	Pond		Bucksport, Me	5,000
	1879	Glenburn, Me	Pushaw Pond		Bucksport, Me	10,000
	1879	Manchester, Me	Cobbosseecontee Lake		Bucksport, Me	5,000
	1879	Washington County, Me	Grand Lake	Saint Croix River	Grand Lake Stream, Me	384,000
	1879	Calais, Me	Nash's Lake	Saint Croix River	Grand Lake Stream, Me	10,600
	1878	Weverton, Md	Pond	Potomac River	Baltimore, Md	500
	1878	Spencerville, Md	Stream	Patuxent River	Baltimore, Md	500
	1878	Emmittsburgh, Md	Crystal Iron Springs	Monocacy River	Baltimore, Md	2,500
	1878	Forestville, Md	Pond	Patuxent River	Baltimore, Md	1,000
	1878	Hood's Mills, Md	Pond	Patapsco River	Baltimore, Md	3,500
	1878	Reisterstown, Md	Pond	Gwynn's Falls	Baltimore, Md	250
	1878	Cockeysville, Md	Gunpowder River		Baltimore, Md	23,000
	1878	Elk Ridge Landing, Md	Cascade Branch	Patapsco River	Baltimore, Md	500
	1878	Westminster, Md	Pond	Patapsco River	Baltimore, Md	1,000
	1878	Deer Park, Md	Pond		Baltimore, Md	7,831
	1879	Baltimore, Md	Stream	Beaverdam Creek	Baltimore, Md	750
	1879		Stream	Susquehanna River	Baltimore, Md	1,000
	1879	Baltimore, Md	Pond	Charles River	Baltimore, Md	500
	1879	Baltimore, Md	Druid Hill Lake		Baltimore, Md	8,000
	1879	Baltimore, Md	Druid Hill Lake		Baltimore, Md	2,000
	1879	Baltimore, Md	Druid Hill Lake		Baltimore, Md	2,000
	1879	Westminster, Md	Pond	Little Pipe Creek	Baltimore, Md	1,000
	1879	Westminster, Md	Cobb's Branch	Little Pipe Creek	Baltimore, Md	2,000
	1879	Hampton, Md	Pond	Gunpowder River	Baltimore, Md	1,000
	1879	Baltimore, Md	Lake	Stony Run	Baltimore, Md	500
	1879	Union Bridge, Md	Pond	Big Pipe Creek	Baltimore, Md	500
	1879	Union Bridge, Md	Pond	Big Pipe Creek	Baltimore, Md	1,000
	1879	Reisterstown, Md	Lake	Patapsco Falls	Baltimore, Md	500
	1879	Baltimore, Md	Druid Hill Pond		Baltimore, Md	2,000
	1879	Harford County, Md	Green Spring Run	Jones Falls	Baltimore, Md	1,500
	1879	Baltimore, Md	Druid Hill Lake	Jones' Falls	Baltimore, Md	1,000
	1879	Easton, Md	Pond	Miles' Creek	Baltimore, Md	250
	1879	Easton, Md	Pond		Baltimore, Md	250
	1879	Easton, Md	Pond	Miles' Creek	Baltimore, Md	500
	1879	Easton, Md	Pond	Miles' Creek	Baltimore, Md	250
	1879	Easton, Md	Pond	Monocacy River	Baltimore, Md	200
Mar. 22,	1880	Buckeystown, Md	Little Youghiogheny	Potomac River	Baltimore, Md	3,000
Apr. 5,	1880	Oakland, Md	Pond	Monocacy River	Baltimore, Md	500
Apr. 15,	1880	Buckeystown, Md	Pond	Gwynn's Falls	Baltimore, Md	500
Apr. 18,	1880	Pikesville, Md	Pond	Lake Roland	Baltimore, Md	500
Apr. 19,	1880	Green Spring, Md	Pond	Patapsco Falls	Baltimore, Md	500
Apr. 19,	1880	Carrollton, Md	Pond	Patuxent River	Baltimore, Md	500
Apr. 20,	1880	Oakland, Md	Pond	Patuxent River	Baltimore, Md	500
Apr. 20,	1880	Baltimore, Md	Pond	Gwynn's Falls	Baltimore, Md	500
Apr. 20,	1880	Airy Hill, Baltimore County, Md.	Trout Branch	Patuxent River	Baltimore, Md	500
Apr. 20,	1880	Baltimore, Md	Pond	Linganore Creek	Baltimore, Md	500
Apr. 21,	1880	Unionville, Md	Winter's Run	Bush River	Baltimore, Md	500
Apr. 22,	1880	Wilna, Md				

Maryland.....

D.—TABLE III.—*Distribution of Schoodic salmon from* 1874 *to* 1880, *inclusive*—Continued

State.	Date.	Locality.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Number of fish.
Maryland—Cont'd	Apr. 24, 1880	Baltimore, Md	Pond	Gunpowder River	Baltimore, Md	500
	Apr. 26, 1880	Catonsville, Md	Pond	Gwynn's Falls	Baltimore, Md	500
	Apr. 28, 1880	Clear Spring, Md	Mill-dam	Potomac River	Baltimore, Md	500
	Apr. 28, 1880	Bel Air, Md	Pond	Bush River	Baltimore, Md	500
	Apr. 30, 1880	Eden, Md	Pond	Patapsco River	Baltimore, Md	500
	May 1, 1880	Baltimore, Md	Patuxent River	Chesapeake Bay	Baltimore, Md	500
	May 4, 1880		Dripping Spring	Gunpowder River	Baltimore, Md	200
	May 6, 1880	Long Green, Md	Pond	Big Gunpowder River	Baltimore, Md	500
	May 8, 1880	Norrisville, Md	Pond	Deer Creek	Baltimore, Md	500
	May 11, 1880	Frederick, Md	Monocacy River	Potomac River	Baltimore, Md	500
	May 13, 1880	Mount Pleasant, Md	Pond	Monocacy River	Baltimore, Md	500
	May 14, 1880	Denton, Md	Pond	Choptank River	Baltimore, Md	500
	May 17, 1880	Baltimore, Md	Pond	Gunpowder River	Baltimore, Md	500
	May 18, 1880	Fairview, Md	Bush Run	Conocheague River	Baltimore, Md	500
	May 18, 1880	Sulphur Spring, Md	Pond	Patapsco River	Baltimore, Md	500
	May 24, 1880	York Road, Md	Pond	Gunpowder River	Baltimore, Md	500
	May 27, 1880	Sandy Spring, Md	Pond	Patuxent River	Baltimore, Md	500
	May 27, 1880	Sandy Spring, Md	Pond	Northwest River	Baltimore, Md	500
Massachusetts	1876	Sandwich, Mass	Spectacle Pond		Winchester, Mass	3,500
	1876	Winchendon, Mass	Dennison Lake		Winchester, Mass	3,000
	1876	Lunenburgh, Mass	Unkechewalom Pond		Winchester, Mass	4,000
	1876	Lincoln, Mass	Sandy Pond		Winchester, Mass	3,000
	1876	Boxford, Mass	Mitchell's Pond	Ipswich River	Winchester, Mass	4,000
	1876	Westfield, Mass	Congamond Lake		Winchester, Mass	5,000
	1876	South Weymouth, Mass	Weymouth Great Pond		Winchester, Mass	3,000
	1876	Pittsfield, Mass	Pontoosuc Lake		Winchester, Mass	4,000
	1876	North Sandwich, Mass	Great Herring		Winchester, Mass	5,000
	1876	Mendon, Mass	Nipmug Pond		Winchester, Mass	3,000
	1876	South Abington, Mass			Winchester, Mass	3,000
	1876	Wellesley, Mass			Winchester, Mass	3,000
	1876	North Andover, Mass	Great Pond		Winchester, Mass	5,000
	1876	Plymouth, Mass	Halfway Pond		Winchester, Mass	3,000
	1876	Ashburnham, Mass	Nankeag Lake		Winchester, Mass	5,000
	1876	Lancaster, Mass	Ponds		Winchester, Mass	15,000
	1876	Pittsfield, Mass	Pontoosuc Lake		Winchester, Mass	8,000
	1876	South Carver, Mass			Winchester, Mass	3,000
	1876	Cotuit, Mass			Winchester, Mass	4,000
	1876	Berlin, Mass	Gates Pond		Winchester, Mass	3,000
	1876	Athol, Mass			Winchester, Mass	3,000
	1876	Natick, Mass	Dug Pond		Winchester, Mass	3,500
	1876	Framingham, Mass	Sudbury River		Winchester, Mass	3,000
	1876	Winchester, Mass	Wedge Pond		Winchester, Mass	3,000
	1876	Winchester, Mass	Mystic Lake		Winchester, Mass	3,000
	1876	Plymouth, Mass	Halfway Pond		Winchester, Mass	90,000

1877	Wakefield, Mass.	Lake Quannapowitt		Winchester, Mass.	4,000
1877	Waltham, Mass.	Ponds		Winchester, Mass.	1,200
1877	Lunenburgh, Mass.	Unkechewalom Pond		Winchester, Mass.	4,000
1877	Lincoln, Mass.	Sandy Pond		Winchester, Mass.	4,000
1877	Middleborough, Mass.	Assawampsett Lake		Winchester, Mass.	20,000
1877	Newton, Mass.	Crystal Lake		Winchester, Mass.	3,000
1877	South Weymouth, Mass.	Weymouth Great Pond		Winchester, Mass.	4,000
1877	Winchendon, Mass.	Dennison Lake		Winchester, Mass.	4,000
1877	Greenwood, Mass.	Crystal Lake		Winchester, Mass.	4,000
1877	East Bridgewater, Mass.	Sauttucket River		Winchester, Mass.	4,000
1877	Ashburnham, Mass.	Nankeag Lake		Winchester, Mass.	5,000
1877	Boxford, Mass.	Mitchell's Pond	Ipswich River	Winchester, Mass.	3,000
1877	Middleton, Mass.	Middleton Pond		Winchester, Mass.	2,500
1877	Wellfleet, Mass.	Gull Pond		Winchester, Mass.	5,000
1877	Georgetown, Mass.	Pentucket Pond		Winchester, Mass.	2,000
1877	Georgetown, Mass.	Rock Pond		Winchester, Mass.	2,000
1877	Wilbraham, Mass.	Nine-Mile Pond		Winchester, Mass.	5,000
1877	Sandwich, Mass.	Spectacle Pond		Winchester, Mass.	4,000
1877	Framingham, Mass.	Sudbury River		Winchester, Mass.	5,000
1877	Natick, Mass.	Dug Pond		Winchester, Mass.	4,000
1877	Pittsfield, Mass.	Pontoosuc Lake		Winchester, Mass.	5,000
1877	Nantucket, Mass.	Hummock Pond		Winchester, Mass.	2,500
1877	Berlin, Mass.	Gates Pond		Winchester, Mass.	3,000
1877	Braintree, Mass.	Great Pond		Winchester, Mass.	3,000
1877	Lancaster, Mass.	Ponds		Winchester, Mass.	15,000
1877	Duxbury, Mass.	Island Creek Pond		Winchester, Mass.	6,000
1877	Plymouth, Mass.	Halfway Pond		Winchester, Mass.	10,000
1877	Billerica, Mass.	Shawshine River		Winchester, Mass.	8,000
1877	Huntington, Mass.	Norwich Pond		Winchester, Mass.	3,000
1877	Medford, Mass.	Mystic Lake		Winchester, Mass.	1,900
1877	Winchester, Mass.	Wedge Pond		Winchester, Mass.	1,000
1877	Essex, Mass.	Chebacco Pond		Winchester, Mass.	4,000
1878	Wellfleet, Mass.	Gull Pond		Winchester, Mass.	8,000
1878	Middleborough, Mass.	Assawampsett Lake		Winchester, Mass.	30,000
1878	Natick, Mass.	Dug Pond		Winchester, Mass.	4,000
1878	Winchendon, Mass.	Dennison Lake		Winchester, Mass.	4,000
1878	Winchendon, Mass.	Whitney's Pond		Winchester, Mass.	4,000
1878	Winchester, Mass.	Wedge Pond		Winchester, Mass.	4,000
1878	Winchester, Mass.	Mystic Lake		Winchester, Mass.	4,000
1878	Milton, Mass.	Houghton's Pond		Winchester, Mass.	7,000
1878	Harvard, Mass.	Bear Hill Pond		Winchester, Mass.	4,000
1878	Lynn, Mass.	Spring Pond		Winchester, Mass.	1,500
1878	Lynn, Mass.	Flax Pond		Winchester, Mass.	1,500
1878	Wenham, Mass.	Wenham Lake		Winchester, Mass.	4,000
1878	North Rochester, Mass.	Snow's Pond		Winchester, Mass.	5,000
1878	North Andover, Mass.	Great Pond		Winchester, Mass.	4,000
1878	East Bridgewater, Mass.	Sauttucket River		Winchester, Mass.	4,000
1878	West Scituate, Mass.	Scituate Ponds		Winchester, Mass.	4,000
1878	Stockbridge, Mass.	Lake Mahkeenac		Winchester, Mass.	20,000
1878	Stoneham, Mass.	Spot Pond		Winchester, Mass.	8,000
1878	Lawrence, Mass.	Pond		Winchester, Mass.	8,000
1878	Hubbardston, Mass.	Asnaconcomic Pond		Winchester, Mass.	5,000

D.—TABLE III.—*Distribution of Schoodic salmon from 1874 to 1880, inclusive*—Continued.

State.	Date.	Locality.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Number of fish.
Massachusetts—Continued.	1878	North Sandwich, Mass	Great Herring Pond		Winchester, Mass	4,000
	1878	Ashburnham, Mass	Nankeag Lake		Winchester, Mass	8,000
	1878	Fall River, Mass	Sucker Brook		Winchester, Mass	2,500
	1878	Fall River, Mass	Borden Pond		Winchester, Mass	2,500
	1878	Salem, Mass	Suntaug Lake		Winchester, Mass	5,000
	1878	Salem, Mass	Wenham Lake		Winchester, Mass	5,000
	1878	Holyoke, Mass	Ashley Pond		Winchester, Mass	7,000
	1878	Pittsfield, Mass	Pontoosuc Lake		Winchester, Mass	16,000
	1878	Braintree, Mass	Great Pond		Winchester, Mass	8,000
	1878	Wakefield, Mass	Lake Quannapowitt		Winchester, Mass	6,000
	1878	Greenwood, Mass	Crystal Lake		Winchester, Mass	8,000
	1878	Waltham, Mass	Hardy's Pond		Winchester, Mass	4,000
	1878	Plymouth, Mass	Halfway Pond		Winchester, Mass	4,000
	1878	South Weymouth, Mass	Weymouth Great Pond		Winchester, Mass	4,000
	1879	Harvard, Mass	Bear Hill Pond		Winchester, Mass	6,000
	1879	East Brookfield, Mass	Furnace Pond		Winchester, Mass	10,000
	1879	Winchendon, Mass	Dennison Lake		Winchester, Mass	2,000
	1879	Winchendon, Mass	Whitney's Pond		Winchester, Mass	2,000
	1879	Natick, Mass	Dug Pond		Winchester, Mass	3,000
	1879	Milton, Mass	Houghton's Pond		Winchester, Mass	6,000
	1879	Wenham, Mass	Wenham Lake		Winchester, Mass	10,000
	1879	Framingham, Mass	Farm Pond		Winchester, Mass	8,000
	1879	Lynnfield, Mass	Suntaug Lake		Winchester, Mass	8,000
	1879	Ashburnham, Mass	Nankeag Lake		Winchester, Mass	20,000
	1879	Hubbardston, Mass	Asnacomcomic Pond		Winchester, Mass	10,000
	1879	East Brookfield, Mass	Furnace Pond		Winchester, Mass	8,000
	1879	Acton, Mass	Magog Lake		Winchester, Mass	9,000
	1879	Wakefield, Mass	Lake Quannapowitt		Winchester, Mass	3,000
	1879	Middleborough, Mass	Assawamsett Lake		Winchester, Mass	20,000
	1879	Great Barrington, Mass	Lake Buel		Winchester, Mass	6,000
	1879	Stockbridge, Mass	Lake Mahkeenac		Winchester, Mass	20,000
	1879	Mendon, Mass	Nipmug Pond		Winchester, Mass	3,000
	1879	West Scituate, Mass	Scituate Ponds		Winchester, Mass	3,000
	1879	Paxton, Mass	Asnebumskitt Ponds		Winchester, Mass	6,000
	1879	Westfield, Mass	Congamond Lake		Winchester, Mass	20,000
	1879	Rochester, Mass	Mary's Pond		Winchester, Mass	4,000
	1879	Westborough, Mass	Hockomocke Pond		Winchester, Mass	4,000
	1879	Essex, Mass	Chebacco Lake		Winchester, Mass	10,000
	1879	Holyoke, Mass	Wright Pond		Winchester, Mass	6,000
	1879	Milford, Mass	Nipmug Pond		Winchester, Mass	3,000
	1879	Falmouth, Mass	Fresh Pond		Winchester, Mass	3,000
	1879	Mashpee, Mass	Crystal Lake		Winchester, Mass	6,000
	1879	Waltham, Mass	Hardy's Pond	Charles River	Winchester, Mass	2,000
	1880	Mendon, Mass	Nipmug Pond		Winchester, Mass	15,000

	1880	Pittsfield, Mass	Pontoosuc Lake		Winchester, Mass	18,000
	1880	Holliston, Mass	Pond		Winchester, Mass	5,000
	1880	Ashburnham, Mass	Naukeag Lake		Winchester, Mass	10,000
	1880	Sharon, Mass	Pond		Winchester, Mass	5,000
	1880	Groton, Mass	Pond		Winchester, Mass	4,000
	1880	Brewster, Mass	Pond		Winchester, Mass	8,000
	1880	Falmouth, Mass	Fresh Pond		Winchester, Mass	4,000
	1880	Waltham, Mass	Hardy's Pond	Charles River	Winchester, Mass	2,000
	1880	Otis, Mass	Pond		Winchester, Mass	6,000
	1880	Wenham, Mass	Wenham Lake		Winchester, Mass	8,000
	1880	Millbury, Mass	Ponds		Winchester, Mass	4,000
	1880	Sandwich, Mass	Spectacle Pond		Winchester, Mass	2,000
	1880	Braintree, Mass	Great Pond		Winchester, Mass	4,000
	1880	Rochester, Mass	Mary's Pond		Winchester, Mass	4,000
	1880	Stockbridge, Mass	Lake Mahkeenac		Winchester, Mass	20,000
	1880	Great Barrington, Mass	Lake Buel		Winchester, Mass	20,000
	1880	Melrose, Mass	Pond		Winchester, Mass	2,000
	1880	Westfield, Mass	Congamond Lake		Winchester, Mass	20,000
	1880	Yarmouth, Mass	Ponds		Winchester, Mass	8,000
	1880	Winchester, Mass	Wedge Pond		Winchester, Mass	3,500
	1880	Medford, Mass	Mystic Lake		Winchester, Mass	3,500
Michigan	1874	Pokagan, Mich	Dowagiac Creek		Pokagon, Mich	2,000
	May 18, 1876	Richland, Mich	Parker Lake		Pokagon, Mich	4,000
	May 18, 1876	Kalamazoo County, Mich	Long Lake		Pokagon, Mich	1,000
	May 19, 1876	Kalkaska County, Mich	Log Lake		Pokagon, Mich	5,000
	June 1, 1876	Calhoun County, Mich	Hamblin Lake		Pokagon, Mich	3,000
	June 1, 1876	Calhoun County, Mich	Gognac Lake		Pokagon, Mich	3,000
	June 1, 1876	Calhoun County, Mich	Reese Ponds		Pokagon, Mich	1,000
	June 1, 1876	Marshall, Mich	Reed's Ponds		Pokagon, Mich	3,000
	1878	Niles, Mich	Tinkham Lake		Pokagon, Mich	5,000
	1878	Calhoun County, Mich	Metcalfe Lake		Pokagon, Mich	4,000
	1878	Battle Creek, Mich	Gognac Lake		Pokagon, Mich	4,000
	1878	Surry, Mich	Crooked Lake		Pokagon, Mich	4,500
	1878	Clare County, Mich	Roney Lake		Pokagon, Mich	1,500
	1878	Pierson, Mich	Whitefish Lake		Pokagon, Mich	7,000
	1878	Northville, Mich	Rough River		Northville, Mich	4,500
	1880	Roscommon County, Mich	Higgins Lake		Pokagon, Mich	20,000
Minnesota	June —, 1875	Fond du Lac, Minn	Saint Louis River	Lake Superior	Red Wing, Minn	500
	June —, 1875	Ramsey County, Minn	White Bear Lake		Red Wing, Minn	500
	June —, 1875	Ramsey County, Minn	Bass Lake		Red Wing, Minn	100
	June —, 1875	Ramsey County, Minn	Lake Como		Red Wing, Minn	100
	June —, 1875	Ramsey County, Minn	Lake Johanna		Red Wing, Minn	100
	June —, 1875	Rice County, Minn	Near Faribault		Red Wing, Minn	300
	June —, 1875	Rice County, Minn	Northfield Lake		Red Wing, Minn	150
	June —, 1875	Waseca County, Minn	Lake Elysian		Red Wing, Minn	500
	June —, 1875	Breckenridge County, Minn	Red River of the North		Red Wing, Minn	500
	June —, 1875	Steele County, Minn	Near Owatonna		Red Wing, Minn	500
	June —, 1875	Becker County, Minn	Detroit Lake		Red Wing, Minn	200
	June —, 1875	Hennepin County, Minn	Minnetonka Lake		Red Wing, Minn	1,000
	June —, 1875	Meeker County, Minn	Near Litchfield		Red Wing, Minn	100
	June —, 1875		Otter River		Red Wing, Minn	200
	Apr. 14, 1877	Red Wing, Minn	Skillman Pond		Red Wing, Minn	250

D.—TABLE III.—*Distribution of Schoodic salmon from* 1874 *to* 1880, *inclusive*—Continued.

State.	Date.	Locality.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Number of fish.
Minnesota—Cont'd	Apr. 14, 1877	Ramsey County, Minn	White Bear Lake		Red Wing, Minn	7,500
	1878	Ramsey County, Minn	McCann's Lake		Red Wing, Minn	3,500
	1878	Ramsey County, Minn	Rice Pond		Red Wing, Minn	3,500
	1878	Rice County, Minn	Northfield Lake		Red Wing, Minn	1,000
	May —, 1879	Cass County, Minn	Sandy Lake		Willow Brook and Red Wing	5,000
	May —, 1879	Dakota County, Minn	Spring Lake		Willow Brook and Red Wing	5,000
	May —, 1879	Houston County, Minn	Lake Como		Willow Brook and Red Wing	3,000
	June —, 1879	Houston County, Minn	Barnum's Pond		Willow Brook and Red Wing	500
	June —, 1879	Duluth, Minn	Canosia Lake		Willow Brook and Red Wing	5,000
	June —, 1879	Rice County, Minn	Robert's Lake		Willow Brook and Red Wing	4,000
	June —, 1879	Rice County, Minn	Cedar Lake		Willow Brook and Red Wing	4,000
	June —, 1879	Watonwan County, Minn	Long Lake		Willow Brook and Red Wing	3,000
	June —, 1879	Martin County, Minn	Cedar Lake		Willow Brook and Red Wing	3,000
	July —, 1879	Renville County, Minn	Lake Alley		Willow Brook and Red Wing	5,000
	July —, 1879	Renville, County, Minn	Lake Preston		Willow Brook and Red Wing	5,000
	July —, 1879	Wabasha County, Minn	Skeelman's Pond		Willow Brook and Red Wing	5,000
	July —, 1879	Rice County, Minn	Cannon River		Willow Brook and Red Wing	1,000
New Hampshire	1878	Madison, N. H	Silver Lake		Winchester, Mass	5,000
	1878	New Durham, N. H	Merry Meeting Lake		Winchester, Mass	5,000
	1878	Newbury, N. H	Sunapee Lake		Winchester, Mass	6,000
	1878	Grantham, N. H	Stocker's Pond		Winchester, Mass	4,000
	May —, 1879	Raymond, N. H	Jones' Pond		Plymouth, N. H	5,000
	May —, 1879	New Durham, N. H	Merry Meeting Lake		Plymouth, N. H	5,000
	May —, 1879	Wakefield, N. H	East Lake		Plymouth, N. H	5,000
	May —, 1879	Ossipee, N. H	Ossipee Lake		Plymouth, N. H	5,000
	May —, 1879	Manchester, N. H	Massabesic Lake		Plymouth, N. H	5,000
	May —, 1879	Piermont, N. H	Tarlton Pond		Plymouth, N. H	5,000
	June —, 1879	Newbury, N. H	Sunapee Lake		Plymouth, N. H	10,000
	June —, 1879	Springfield, N. H	Star Pond		Plymouth, N. H	1,500
	June —, 1879	Franconia, N. H	Echo Lake		Plymouth, N. H	2,500
	June —, 1879	Bridgewater, N. H	Newfound Lake		Plymouth, N. H	5,000
	June —, 1879	Holderness, N. H	Squam Lake		Plymouth, N. H	10,000
	June —, 1879	Enfield, N. H	Masconia Lake		Plymouth, N. H	5,000
	June —, 1879	Pittsburgh, N. H	Connecticut Lake		Plymouth, N. H	8,000
	June —, 1879	Centre Harbor, N. H	Winnipesaukee Lake		Plymouth, N. H	5,000
	July —, 1879	Sandwich, N. H	Pond		Plymouth, N. H	5,000
	July —, 1879	Manchester, N. H	Nutt's Pond		Plymouth, N. H	5,000
	July —, 1879	Bradford, N. H	Bradford's Pond		Plymouth, N. H	5,000
	July —, 1879	Northfield, N. H	Chestnut Pond		Plymouth, N. H	2,000
	July —, 1879	Cheshire County, N. H	Sundry Ponds		Plymouth, N. H	10,000
	May 4, 1880	Nelson, N. H	Tolman Pond	Merrimack River	Plymouth, N. H	4,000
	May 13, 1880	Sandwich, N. H	Adams Pond	Merrimack River	Plymouth, N. H	1,500
	May 18, 1880	Laconia, N. H	Winnesquam Lake	Merrimack River	Plymouth, N. H	5,000
	May 19, 1880	Stark, N. H	North Pond	Connecticut River	Plymouth, N. H	4,000

	May 20, 1880	Pittsfield, N. H	Berry Pond	Merrimack River	Plymouth, N. H	1,200
	May 21, 1880	Chesterfield, N. H	Spofford Lake	Connecticut River	Plymouth, N. H	3,000
	May 21, 1880	Epsom, N. H	Chestnut Pond		Plymouth, N. H	1,250
	May 25, 1880	Stewartstown, N. H	Diamond Pond	Connecticut River	Plymouth, N. H	2,500
	May 26, 1880	Peterborough, N. H	Cunningham Pond	Merrimack River	Plymouth, N. H	2,500
	May 26, 1880	Rindge, N. H	Emerson Pond	Merrimack River	Plymouth, N. H	2,500
	May 26, 1880	Jaffrey, N. H	Gilmore Pond	Merrimack River	Plymouth, N. H	2,500
	May 28, 1880	Conway, N. H	Walker's Pond	Saco River	Plymouth, N. H	6,000
	June 2, 1880	Nelson, N. H	Newfound Lake	Merrimack River	Plymouth, N. H	3,000
	June 2, 1880	Canaan, N. H	Hart's Pond	Merrimack River	Plymouth, N. H	2,500
	June 8, 1880	Boscawen, N. H	Walker's Pond	Merrimack River	Plymouth, N. H	2,000
	June 9, 1880	Benton, N. H	Long Pond	Connecticut River	Plymouth, N. H	3,000
	June 10, 1880	Newbury	Sunapee Lake	Connecticut River	Plymouth, N. H	4,000
	June 10, 1880	Warner, N. H	Bean Pond	Merrimack River	Plymouth, N. H	3,000
	June 10, 1880	Acworth, N. H	Cold Pond	Connecticut River	Plymouth, N. H	3,000
	June 14, 1880	Franconia, N. H	Echo Lake	Connecticut River	Plymouth, N. H	3,000
	June 17, 1880	Sandwich, N. H	North Pond	Merrimack River	Plymouth, N. H	2,000
New Jersey	1878	Morris County, N. J	Green Pond		Bloomsbury, N. J	10,000
	1878	Sussex County, N. J	Morris Pond		Bloomsbury, N. J	9,000
	1878	Andover, N. J	Strubel's Lake		Bloomsbury, N. J	39,000
	1879	Sussex County, N. J	Drake's Pond	Paulinskill River	Bloomsbury, N. J	1,000
	1879	Passaic County, N. J		Passaic River	Bloomsbury, N. J	2,000
	1879	Ringwood, N. J	Shepherd's Lake	Passaic River	Bloomsbury, N. J	9,400
	1879	Oxford, N. J	Greens Pond	Pequest River	Bloomsbury, N. J	4,000
	1879	Drakesville, N. J	Lake Hopatkong	South Branch Raritan River	Bloomsbury, N. J	16,904
	Dec. —, 1879	Morris County, N. J	Lakes		Bloomsbury, N. J	18,000
	Dec. —, 1879	Bergen County, N. J	Lakes		Bloomsbury, N. J	11,400
	Dec. —, 1879	Warren County, N. J	Lakes		Bloomsbury, N. J	4,000
New York	1878	Caledonia, N. Y	Spring Creek		Caledonia, N. Y	2,000
	1879	Herkimer County, N. Y	Woodhull Lake		Caledonia, N. Y	5,000
	1879	Monroe County, N. Y	Allen Creek	Lake Ontario	Caledonia, N. Y	10,000
	1879	Duchess County, N. Y	Sylvan Lake		Clove, N. Y	3,000
	1879	Duchess County, N. Y	Upton's Pond		Clove, N. Y	3,000
	1879	Duchess County, N. Y	Long Pond		Clove, N. Y	3,000
	1879	Duchess County, N. Y	Furnace Pond		Clove, N. Y	10,000
	1879	Duchess County, N. Y	Little Thala Pond		Clove, N. Y	5,000
North Carolina	Apr. —, 1878	Morganton, N. C	John's River	Catawba River	Baltimore, Md	1,000
	Apr. —, 1878	Morganton, N. C	Linnville River	Catawba River	Baltimore, Md	4,400
	Apr. —, 1878	Charlotte, N. C	Ponds	Catawba River	Baltimore, Md	500
	Apr. —, 1878	Greensborough, N. C	Ponds	Cape Fear River	Baltimore, Md	2,000
	Apr. —, 1878	Morganton, N. C	Ponds	Catawba River	Baltimore, Md	600
	Apr. —, 1878	Salisbury, N. C	Ponds	Yadkin River	Baltimore, Md	1,000
	Apr. —, 1878	Rockingham, N. C	Moyo River	Dan River	Baltimore, Md	3,000
	Apr. —, 1878	Danbury, N. C	Dan River	Roanoke River	Baltimore, Md	3,000
Ohio	1876	Put-in Bay, Ohio	Lake Erie		Toledo, Ohio	20,000
	1876		Maumee Rapids		Toledo, Ohio	9,000
	1876	Fremont, Ohio	Sandusky River		Toledo, Ohio	5,000
	1878	Toledo (12 miles above), Ohio	Maumee River	Lake Erie	Toledo, Ohio	12,000
	1879		Maumee River	Lake Erie	Toledo, Ohio	6,000
Pennsylvania	1878	Solebury, Pa	Aquetong Lake	Delaware River	New Hope, Pa	9,444
	1878	Schuylkill County, Pa	Schuylkill River	Delaware River	Marietta, Pa	2,300
	1878	Wayne County, Pa	Jones' Lake		Marietta, Pa	5,000

D.—TABLE III.—*Distribution of Schoodic salmon from* 1874 *to* 1880, *inclusive*—Continued.

State.	Date.	Locality.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Number of fish.
Pennsylvania—Continued.	1878	Luzerne County, Pa	Beaver Lake		Marietta, Pa	2,500
	1878	Hazleton, Pa			Marietta, Pa	4,000
	1878	Pike County, Pa	Lakes		Marietta, Pa	2,500
	1878	Monroe County, Pa	Lakes		Marietta, Pa	2,500
	1878	Somerset County, Pa			Marietta, Pa	250
	1878	Wilkes Barre, Pa	Harvey's Lake	Susquehanna River	Marietta, Pa	5,000
	1878	Wayne County, Pa			Marietta, Pa	5,000
	1878	Warren County, Pa	Pond		Corry, Pa	7,000
	1878	Corry, Pa	Hatching ponds		Corry, Pa	3,000
	1879	Wilkes Barre, Pa	Harvey's Lake	Susquehanna River	Marietta, Pa	6,000
	1879	Scranton, Pa	Tobyhanna Lake	Lehigh River	Marietta, Pa	3,000
	1879	Scranton, Pa	Paunock Lake	Lehigh River	Marietta, Pa	11,500
	1879	White Haven, Pa	Big Pond	Lehigh River	Marietta, Pa	1,500
	1879	White Haven, Pa	Moses Wood Pond	Lehigh River	Marietta, Pa	1,500
	1879	Erie, Pa	Bay	Lake Erie		10,000
	1879	Potter County, Pa			Corry, Pa	2,000
	Apr. 8, 1880	Luzerne County, Pa	Bear Lake	Susquehanna River	Marietta, Pa	5,000
	Apr. 8, 1880	Susquehanna County, Pa	Heart Lake	Susquehanna River	Marietta, Pa	4,000
	Apr. 8, 1880	Susquehanna County, Pa	Tigley Lake	Wyalusing Creek	Marietta, Pa	1,000
	Apr. 12, 1880	Lancaster County, Pa	Donegal Run	Susquehanna River	Marietta, Pa	500
	1880	Erie County, Pa	Conneaut Creek		Corry, Pa	2,000
	1880	Erie County, Pa	Le Boeuf Creek		Corry, Pa	2,000
	1880	Erie County, Pa	French Creek		Corry, Pa	2,000
	1880	Westmoreland County, Pa	Allegheny River	Ohio River	Corry, Pa	2,000
Rhode Island	1876	Burrillville, R. I	Wallum Pond	Swamp Pascoag Reservoir	Ponegansett, R. I	2,500
	1876	North Scituate, R. I	Moswansicut Pond		Ponegansett, R. I	2,500
	1876	North Scituate, R. I	Steers' Pond		Ponegansett, R. I	2,500
	1876	Foster, R. I	Searles' Pond	Pawtuxet River	Ponegansett, R. I	2,500
	1876	Foster, R. I	Tilly Pond	Pawtuxet River	Ponegansett, R. I	2,500
	1876	Warwick, R. I	Gorton's Pond	Providence River	Ponegansett, R. I	2,500
	1876	Warwick, R. I	Warwick Pond	Providence River	Ponegansett, R. I	2,500
	1876	Richmond, R. I	Beach Pond	Beaver River	Ponegansett, R. I	2,100
	1878	Burrillville, R. I	Wallum Pond	Swamp Pascoag Reservoir	Ponegansett, R. I	5,000
	1878	Kingston, R. I	Warden's Pond	Pawcatuck River	Ponegansett, R. I	2,000
	1878	North Scituate, R. I	Moswansicut Pond		Ponegansett, R. I	2,000
	1878	North Scituate, R. I	Steer's Pond		Ponegansett, R. I	500
South Carolina	1880			Seneca River	N. C. Hatchery	8,000
	1880		Hampton Creek			3,000
	1880		Mill Creek			4,000
Vermont	Apr. 19, 1876	Fairfield, Vt	Fairfield Pond			5,000
	May 2, 1876	Franklin, Vt	Franklin Pond			5,000
	May 3, 1876	Salisbury, Vt	Dunmore Lake			5,000
	May 5, 1876	Essex, Vt	Winooski River			6,000
	May 11, 1876	Washington County, Vt	Kettle Pond			1,000

	May 15, 1876	Barton, Vt	Barton Pond			1,500
	1876	Brattleborough, Vt				2,000
	1876	Castleton, Vt	Ponds			4,000
	1876	Hubbardton, Vt	Ponds			3,000
	1876	Orwell, Vt	Ponds			3,000
	1876	Bennington County, Vt	Ponds			2,000
	May 15, 1876	Barnet, Vt	Harvey's Pond	Connecticut River		1,000
	May 19, 1876	Morgan, Vt	Seymour Lake			1,500
	1878	Saint Johnsbury, Vt	Small ponds	Connecticut River	Saint Johnsbury, Vt	3,000
	1878	Danville, Vt	Joe's Pond	Connecticut River	Saint Johnsbury, Vt	6,000
	1878	Waterford, Vt	Style's Pond	Connecticut River	Saint Johnsbury, Vt	3,000
	1878	Westmore, Vt	Lake Willoughby	Lake Memphremagog	Saint Johnsbury, Vt	3,500
	1878	Barton, Vt	Bellwater Pond	Lake Memphremagog	Saint Johnsbury, Vt	3,500
	1878	Greensborough, Vt	Greensborough Pond		Saint Johnsbury, Vt	2,500
	1878	Barnet, Vt	Harvey's Pond	Connecticut River	Saint Johnsbury, Vt	2,500
Virginia	1875	Central, Va	New River			2,500
	1877		Shenandoah	South Branch		3,000
	1877	Smyth County, Va	Holston River			1,000
	1877	Rockbridge County, Va	Irish Creek			250
	1877	Nelson County, Va	Tye River			2,750
	1877	Rockbridge County, Va	Buffalo Creek	James River		3,500
	1877	Wytheville, Va	New River	Kanawha River		3,000
	1878		Tom's River	New River		22,000
	1878		Strouble's Creek	New River		5,000
	1878	Wytheville, Va	Pond	New River	Blacksburgh, Va	2,000
	1878	Blacksburgh, Va	Streams	New River	Blacksburgh, Va	8,000
	1878	Lexington, Va	North River	James River	Lexington, Va	300
	May 31, 1879	Farmville, Va	Appomattox River	James River	Lexington, Va	6,000
	June 7, 1879	Lexington, Va	South River	James River	Lexington, Va	2,500
	June 9, 1879	Staunton, Va	Middle River	Shenandoah River	Lexington, Va	6,500
	June 12, 1879	Lexington, Va	Buffalo Creek	James River	Lexington, Va	250
	June 14, 1879	Lexington, Va	McKee's Spring	James River	Lexington, Va	300
	June 16, 1879	Clifton Forge, Va	Jackson River	James River	Lexington, Va	6,500
	July 7, 1879	Fincastle, Va	Craig's Creek	James River	Lexington, Va	2,800
	July 23, 1879	Lexington, Va	North River	James River	Lexington, Va	2,500
	Mar. 25, 1880	Wytheville, Va	Barret's Pond	New River	Wytheville, Va	4,000
	Mar. 29, 1880	Salem, Va	Lake Spring	Roanoke River	Wytheville, Va	250
	Mar. 31, 1880	Wythe Lead Mines, Va	New River	Kanawha River	Wytheville, Va	8,000
	April 2, 1880	Saltville, Va	North Fork Holston River	Holston River	Wytheville, Va	7,000
	April 5, 1880	Central, Va	New River	Kanawha River	Wytheville, Va	4,000
	April 5, 1880	Wytheville, Va	New River	Kanawha River	Wytheville, Va	250
West Virginia	1878	Wetzel County, W. Va	Fishing Creek		Romney, W. Va	5,000
	1878	Parkersburgh, W. Va	Bartlett's Pond		Romney, W. Va	100
	1878	Marion County, W. Va	Dent's River		Romney, W. Va	200
	1878	Marion County, W. Va	Meadow Run		Romney, W. Va	200
	1878	Marion County, W. Va	Branch of Buffalo Creek		Romney, W. Va	100
	1878	Marion County, W. Va	Prichard's Run		Romney, W. Va	200
	1878	Marion County, W. Va	Buffalo Creek		Romney, W. Va	100
	1878	Hampshire County, W. Va	Mill Creek		Romney, W. Va	500
	1878	Hampshire County, W. Va	Dillon's Creek		Romney, W. Va	800
	1878	Hardy County, W. Va	Trout Run		Romney, W. Va	300
	1878	Randolph County, W. Va	Tributaries	Tygart's Valley Run	Romney, W. Va	1,000

D.—TABLE III.—*Distribution of Schoodic salmon from 1874 to 1880, inclusive*—Continued.

State.	Date.	Nearest post-office, town, or village.	Waters in which fish were placed.	Tributary of—	Where finally hatched.	Number of fish.
West Virginia—Continued.	1879	Romney, W. Va	Pond at Institution for Deaf	Potomac River	Romney, W. Va	400
	1879	Hampshire County, W. Va	Dillon's Run	Potomac River	Romney, W. Va	600
	1879	Parkersburgh, W. Va	Pond		Romney, W. Va	200
	1879	Romney, W. Va	Fountain at Institution for Deaf, etc.	Potomac River	Romney, W. Va	50
	1879	Clarksburgh, W. Va	West Fork	Monongahela River	Romney, W. Va	2,000
	1879	Weston, W. Va	West Fork	Monongahela River	Romney, W. Va	1,500
	1879	Cold Spring, W. Va	Wheeling Creek	Ohio River	Romney, W. Va	5,000
	1879	Littleton, W. Va	Fish Creek	Ohio River	Romney, W. Va	5,000
	1879	White Sulphur Springs, W. Va	Dry Fork	Greenbrier River	Romney, W. Va	3,000
	1879	Williamsport, W. Va	William's Spring	Patterson's Creek	Romney, W. Va	1,000
	1879	Hamot's Mill, Hampshire County, W. Va.	Mill Creek	Potomac River	Romney, W. Va	500
	1879	Hamot's Mill, Hampshire County, W. Va.	Mill Creek	Potomac River	Romney, W. Va	1,500
	1879	Hampshire County, W. Va	Tributaries	South Branch, Potomac River	Romney, W. Va	3,000
	1879	Romney, W. Va	Tributaries	South Branch, Potomac River	Romney, W. Va	15,000
	1879	Hinton, W. Va	Greenbrier River	New River	Romney, W. Va	5,669
Wisconsin	1876	Madison, Wis	Lake		Palmer's Hatchery	10,000
	1876		Oconomowoc Lake			10,000
	1876					10,000
	1876	Walworth County, Wis	Geneva Lake	Illinois River	Geneva Lake	8,000
	1878	Walworth County, Wis	Geneva Lake	Illinois River	Geneva Lake	5,000
	1879		Clear Lake		Madison, Wis	2,000
	1879		Silver Lake		Madison, Wis	10,000
	1879	Walworth County, Wis	Geneva Lake		Madison, Wis	10,000
	1879		Nagawicka Lake		Madison, Wis	12,000
	1879		Green River		Madison, Wis	3,000

D.—TABLE IV.—*Distribution of Penobscot salmon from 1873 to 1880, inclusive.*

State.	Date.	Locality.	Tributaries.	Waters stocked.	Where finally hatched.	Number of fish.
California	1874	Redding, Cal		Sacramento River		305
Connecticut	1873			Saugatuck River	Poquonock, Conn	1,300
	1873			Southport River	Poquonock, Conn	1,360
	1873		Tributaries	Connecticut River	Poquonock, Conn	34,880
	1873		Main River	Mystic River	Westport, Conn	1,516
	1873		Tributaries	Thames River	Westport, Conn	3,032
	1873	North Branford, Conn		Main River	North Branford, Conn	10,616
	1873		Main River	Housatonic River	North Branford, Conn	21,233
	1875	New Hartford, Conn	Farmington River	Connecticut River	Westport, Conn	65,000
	1875	New Milford, Conn	Butter Brook	Housatonic River	Westport, Conn	20,000
	1875	Guilford, Conn	Guilford Creek		Westport, Conn	10,000
	1875	Willimantic, Conn	Shetucket River	Thames River	Westport, Conn	10,000
	1875	Southport, Conn	Mill River		Westport, Conn	5,000
	1875	Westport, Conn	Saugatuck River		Westport, Conn	5,000
	May 13, 1877	Southport, Conn	Mill River		Westport, Conn	2,500
	May 16, 1877	New Milford, Conn	Housatonic River	Long Island Sound	Westport, Conn	12,500
	May 17, 1877		Natchaug Branch	Thames River	Westport, Conn	12,500
	May 19, 1877	New Hartford, Conn	Farmington River	Connecticut River	Westport, Conn	72,100
Illinois	1874	Kensington, Ills	Calumet River	Lake Michigan	Pokagon, Mich	10,000
	1874	Wildwood, Ills	Calumet River	Lake Michigan	Pokagon, Mich	8,000
	1874	South Lawn, Ills	Calumet River	Lake Michigan	Pokagon, Mich	7,000
	1875	Elgin, Ills	Fox River	Illinois River	Elgin, Ill	19,000
Iowa	May —, 1875	Dubuque, Iowa	Dubuque Creek	Mississippi River	Anamosa, Iowa	3,000
	June 6, 1875	Council Bluffs, Iowa		Mississippi River	Anamosa, Iowa	10,000
	June 6, 1875	Cedar Rapids, Iowa	Cedar River	Mississippi River	Anamosa, Iowa	4,000
	June 10, 1875	Waverly, Iowa		Mississippi River	Anamosa, Iowa	25,000
	June 17, 1875	West Union, Iowa	Turkey River	Mississippi River	Anamosa, Iowa	15,000
	1875	Marshalltown, Iowa	Iowa River	Mississippi River	Anamosa, Iowa	5,000
	July 2, 1875	Manchester, Iowa	Maquoketa River	Mississippi River	Anamosa, Iowa	2,000
	July 2, 1875	Worthington, Iowa	North Maquoketa River	Mississippi River	Anamosa, Iowa	2,000
	July 3, 1875	Monmouth, Iowa	Bear Creek	Mississippi River	Anamosa, Iowa	4,000
	June 23, 1876		Boyer River	Missouri River	Anamosa, Iowa	5,000
	July 14, 1876		Clear Lake	Coon River	Anamosa, Iowa	10,000
	July 14, 1876		Marion Lake		Anamosa, Iowa	10,000
	July 14, 1876	Emmet County, Iowa	Lakes		Anamosa, Iowa	10,000
	July 24, 1876		Storm Lake	Coon River	Anamosa, Iowa	20,000
	July 24, 1876		Spirit Lake	Sioux River	Anamosa, Iowa	10,000
	July 24, 1876		Twin Lakes		Anamosa, Iowa	5,000
Maine	1873			Penobscot River	Bucksport, Me	50,250
	1873			Saint Croix River	Bucksport, Me	7,500
	1873			Androscoggin River	Bucksport, Me	97,000
	1874	Eaton, Me	Mattawamkeag River	Penobscot River	Bucksport, Me	22,500
	1874	Danforth, Me	Mattawamkeag River	Penobscot River	Bucksport, Me	22,500
	1874		Salmon Streams	Penobscot River	Bucksport, Me	25,000

D.—TABLE IV.—*Distribution of Penobscot salmon from 1873 to 1880, inclusive*—Continued.

State.	Date.	Locality.	Tributaries.	Waters stocked.	Where finally hatched.	Number of fish.
Maine—Continued	1874	.....	Tributaries of Baskahegan River.	Penobscot River	Bucksport, Me	5,000
	1874	.....	Passadumkeag River	Penobscot River	Bucksport, Me	10,000
	1874	Whitney Ridge, Me	Sebovis River	Penobscot River	Bucksport, Me	25,000
	1874	Howland, Me	Sebovis River	Penobscot River	Bucksport, Me	25,000
	1874	Milo, Me	Piscataquis River	Penobscot River	Bucksport, Me	15,000
	1874	Brownville, Me	Pleasant River	Penobscot River	Bucksport, Me	15,000
	1874	Dover, Me	Piscataquis River	Penobscot River	Sebec Lake, Me	25,000
	1874	.....	Sebec Lake	Penobscot River	Sebec Lake, Me	20,000
	1874	Dobsis Stream, Me	Schoodic Lake	Saint Croix River	Dobsis Stream, Me	10,000
	1874	.....	.....	Penmaquan River	Pembroke, Me	8,613
	1875	Howland, Me	Sebovis River	Penobscot River	Bucksport, Me	30,000
	1875	.....	Madacenuk Stream	Penobscot River	Bucksport, Me	15,000
	1875	.....	Salmon Stream	Penobscot River	Bucksport, Me	5,000
	1875	Bancroft, Me	Mattawamkeag River	Penobscot River	Bucksport, Me	20,000
	1875	.....	.....	Penobscot River	Bucksport, Me	45,000
	1875	.....	.....	Penobscot River	Bucksport, Me	94,000
	1876	.....	Penquamau River	.....	Pembroke, Me	35,000
	1876	.....	Denny's River	.....	Pembroke, Me	35,000
	1876	Surry, Me	Patten's Brook	.....	Bucksport, Me	100,000
	1876	Bancroft, Me	Mattawamkeag River	Penobscot River	Bucksport, Me	50,000
	1876	Kingman, Me	Mattawamkeag River	Penobscot River	Bucksport, Me	50,000
	1876	Winn, Me	.....	Penobscot River	Bucksport, Me	50,000
	1876	Livermore Falls, Me	Androscoggin River	.....	.....	100,000
Maryland	1875	Fort Pendleton, Md	North Branch	Potomac River	Green Spring Valley, Md ...	16,000
	1875	.....	Deer Creek	Susquehanna River	Green Spring Valley, Md ...	19,000
	1875	.....	.....	Gunpowder River	Green Spring Valley, Md ...	18,900
	1875	.....	.....	Patuxent River	Green Spring Valley, Md ...	18,900
	Mar. 23, 1880	.....	Upper Waters of	Susquehanna River	Druid Hill Park, Md	23,000
	Mar. 24, 1880	Mechanicstown, Md	Hunting Creek	Monocacy River	Druid Hill Park, Md	3,000
	Apr. 5, 1880	Oakland, Md	North Fork	Potomac River	Druid Hill Park, Md	10,000
	Apr. 6, 1880	Piedmont, Md	South Fork	Potomac River	Druid Hill Park, Md	10,000
	Apr. 9, 1880	Greencastle, Pa	.....	Conococheague River	Druid Hill Park, Md	5,000
	Apr. 9, 1880	Gettysburgh, Pa	Rock Creek	Monocacy River	Druid Hill Park, Md	7,929
Massachusetts	1873	.....	.....	Merrimac River	Winchester, Mass	21,450
	1873	.....	.....	Mystic River	Winchester, Mass	1,430
	1873	.....	.....	Red Brook	Winchester, Mass	1,430
	1874	Palmer, Mass	Quobaug Pond	Red Brook	Westbrook, Conn	30,000
	1874	.....	Westfield River	Connecticut River	State Hatchery	17,000
	Spring, 1876	Cotuit, Mass	Cotuit River	.....	Winchester, Mass	10,000
	Spring, 1876	Lancaster, Mass	Nashua River	.....	Winchester, Mass	10,000
Michigan	1873	Pontiac, Mich	Lord's Lake	Lake Saint Clair	Clarkston, Mich	500
	1873	Oakland County, Mich	Orchard Lake	Lake Saint Clair	Clarkston, Mich	500
	1873	Oakland County, Mich	Walf's Lake	Lake Saint Clair	Clarkston, Mich	500

		1873	Washtenaw County, Mich	Whitmore Lake	Lake Saint Clair	Clarkston, Mich	500
		1873	Hillsdale County, Mich	Gun Lake	Lake Saint Clair	Clarkston, Mich	500
		1873	Hillsdale County, Mich	Barrier Lake	Lake Saint Clair	Clarkston, Mich	500
		1873		Diamond Lake	Lake Saint Clair	Clarkston, Mich	1,000
		1873		Barrier Lake	Lake Erie	Clarkston, Mich	500
		1873	Calhoun County, Mich	Lake near Marshall	Lake Erie	Clarkston, Mich	500
		1873	Hillsdale County, Mich	Headwaters Saint Joseph River.	Lake Michigan	Clarkston, Mich	500
		1873		North Branch Saint Joseph River.	Lake Michigan	Clarkston, Mich	1,000
		1873	Saint Joseph, Mich	North Branch Saint Joseph River.	Lake Michigan	Clarkston, Mich	1,000
		1873		Tributaries of Saint Joseph River.	Lake Michigan	Clarkston, Mich	1,500
		1873	Jackson County, Mich	Headwaters Kalamazoo River	Lake Michigan	Clarkston, Mich	500
		1873	Jackson County, Mich	Grand River	Lake Michigan	Clarkston, Mich	500
		1873	Jackson County, Mich	Muskegon River	Lake Michigan	Clarkston, Mich	1,500
		1873		Manistee River	Lake Michigan	Clarkston, Mich	1,500
		1873	Roscommon County, Mich	Au Sable River	Lake Huron	Clarkston, Mich	2,000
		1874		Pine River	Manistee River	Pokagon, Mich	40,000
		1874		Salmon Creek	Boardman River	Pokagon, Mich	40,000
		1874	Roscommon County, Mich	Higgin's Lake	Muskegon River	Pokagon, Mich	7,000
		1874			Saint Mary's River	Pokagon, Mich	25,000
		1875		Dowagiac River	Saint Joseph River	Pokagon, Mich	5,000
Minnesota	June —,	1875	Ramsey County, Minn	White Bear Lake	Chippewa River	Red Wing, Minn	7,000
	June —,	1875	Ramsey County, Minn	Bass Lake	Mississippi River	Red Wing, Minn	300
	June —,	1875	Ramsey County, Minn	Como Lake	Mississippi River	Red Wing, Minn	500
	June —,	1875	Ramsey County, Minn	Johanna Lake	Mississippi River	Red Wing, Minn	500
	June —,	1875	Rice County, Minn	Faribault Lake	Mississippi River	Red Wing, Minn	1,000
	June —,	1875	Rice County, Minn	Robert's Lake	Mississippi River	Red Wing, Minn	400
	June —,	1875	Rice County, Minn	Dudley Lake	Mississippi River	Red Wing, Minn	400
	June —,	1875	Rice County, Minn	Jackson Lake	Mississippi River	Red Wing, Minn	400
	June —,	1875	Rice County, Minn	Lakes	Mississippi River	Red Wing, Minn	400
	June —,	1875	Rice County, Minn	Barry Hunt's Lake	Mississippi River	Red Wing, Minn	400
	June —,	1875	Rice County, Minn	Cedar Lake	Mississippi River	Red Wing, Minn	1,000
	June —,	1875	Dakota County, Minn	Farmington River	Mississippi River	Red Wing, Minn	500
	June —,	1875	Saint Peter, Minn		Minnesota River	Red Wing, Minn	800
	June —,	1875	Mankato, Minn		Minnesota River	Red Wing, Minn	800
	June —,	1875	Waseca County, Minn	Elysian Lake	Minnesota River	Red Wing, Minn	1,000
	June —,	1875	Breckenridge, Minn	Red River of the North	Winnipeg Lake	Red Wing, Minn	3,000
	June —,	1875	Crow Wing County, Minn	Withington Lake	Mississippi River	Red Wing, Minn	500
	June —,	1875	Crow Wing County, Minn	Brainerd Lake	Mississippi River	Red Wing, Minn	500
	June —,	1875	Steele County, Minn	Owatonna Lake	Mississippi River	Red Wing, Minn	100
	June —,	1875	Becker County, Minn	Detroit Lake	Red River of the North	Red Wing, Minn	800
	June —,	1875	Freeborn County, Minn	Albert Lea	Mississippi River	Red Wing, Minn	500
	June —,	1875	Perham, Minn	Pine Lakes	Red River of the North	Red Wing, Minn	500
	June —,	1875	Hennepin County, Minn	Minnetonka Lake	Mississippi River	Red Wing, Minn	1,000
	June —,	1875	Wright County, Minn	Howard Lake	Mississippi River	Red Wing, Minn	500
	June —,	1875	Litchfield, Minn	Crow River	Mississippi River	Red Wing, Minn	500
	June —,	1875	Willmar, Minn	Foote Lake		Red Wing, Minn	500
				Otter River		Red Wing, Minn	800
New Hampshire		1873	Woodstock, N. H	Headwaters	Merrimac River	Meredith, N. H	3,000

D.—TABLE IV.—*Distribution of Penobscot salmon from 1873 to 1880, inclusive*—Continued.

State.	Date.	Locality.	Tributaries.	Waters stocked.	Where finally hatched.	Number of fish.
New Hampshire—Continued.	1873	Thornton, N. H		Merrimac River	Meredith, N. H	3,000
	1873	West Campton, N. H		Merrimac River	Meredith, N. H	3,000
	1873	Campton, N. H		Merrimac River	Meredith, N. H	3,000
	1873	Plymouth, N. H		Merrimac River	Meredith, N. H	2,500
	1874	Sundry places	Headwaters	Connecticut River	Concord, N. H	50,000
	1874	Charlestown, N. H		Connecticut River	Charlestown, N. H	15,000
	1874	Sundry places	Headwaters and Tributaries	Connecticut River	Winchester, Mass	97,000
	1875	Plymouth, N. H	Pemigewasset River	Merrimac River	Winchester, Mass	70,000
	1875		Contoocook River	Merrimac River	Winchester, Mass	10,000
	1876	Franklin, N. H	Pemigewasset River	Merrimac River	Winchester, Mass	50,000
	1876	Warren, N. H	Baker River	Merrimac River	Winchester, Mass	50,000
New Jersey	1873		Salmon Run	Raritan River	Bloomsbury, N. J	15,000
	1873		Musconetcong River	Delaware River	Bloomsbury, N. J	18,000
	1874			Delaware River	Bloomsbury, N. J	12,000
	1874		Musconetcong River	Delaware River	Bloomsbury, N. J	65,000
	1874			Raritan River	Bloomsbury, N. J	31,000
	1874			Hackensack River	Bloomsbury, N. J	10,000
	1874			Passaic River	Bloomsbury, N. J	50,000
	1875	Morristown, N. J	Whippany River	Passaic River	Bloomsbury, N. J	1,000
	1875	Dover, N. J	Rockaway River	Passaic River	Bloomsbury, N. J	1,000
	1875	South Branch, N. J	South Branch	Raritan River	Bloomsbury, N. J	3,000
	1875		Paulinskill River	Delaware River	Bloomsbury, N. J	24,666
	1875		Pohatcong River	Delaware River	Bloomsbury, N. J	24,666
	1875		Musconetcong River	Delaware River	Bloomsbury, N. J	24,668
	Dec. 26, 1879	80 miles north of Trenton, N. J.	Shumaker's Eddy	Delaware River	Bloomsbury, N. J	20,572
New York	1873			Hudson River	Caledonia, N. Y	30,000
	1873		Salmon River	Lake Ontario	Caledonia, N. Y	15,000
	1873		Oswego River	Lake Ontario	Caledonia, N. Y	15,000
	1873		Small tributaries	Long Island Sound	Bloomsbury, N. J	2,500
	1875	Monroe County, N. Y	Allen's Creek	Lake Ontario	Caledonia, N. Y	10,000
	1875	Rome, N. Y	Mohawk River	Hudson River	Caledonia, N. Y	20,000
	1875	West Plattsburgh, N. Y	Saranac River	Hudson River	Charlestown, N. H	36,500
	1875	Peru, N. Y	Salmon River	Hudson River	Charlestown, N. H	10,000
	1875	Ellenburgh, N. Y	Chazy River	Hudson River	Charlestown, N. H	48,500
Ohio	1873	Castalia, Ohio	Castalia Spring Stream	Lake Erie	Castalia, Ohio	2,500
	1875	Toledo, Ohio	Maumee River	Maumee Bay	Castalia, Ohio	10,000
	1875	Fremont, Ohio	Sandusky River	Sandusky Bay	Castalia, Ohio	10,000
	1875	Put-in-Bay, Ohio		Lake Erie	Castalia, Ohio	30,000
Pennsylvania	1872	Bushkill, Pa	Bushkill Creek	Delaware River	State Hatchery	10,000
	1873	Easton, Pa	Hitzman Spring Brook	Delaware River	Easton, Pa	25,000
	1874	Northampton County, Pa	Bushkill Creek	Delaware River	Marietta, Pa	55,000
	1874	Dauphin County, Pa	Swatara Creek	Susquehanna River	Marietta, Pa	30,000
	1874	Lancaster County, Pa	Chiquesalonga Creek	Susquehanna River	Marietta, Pa	25,000
	1874		Donegal Creek	Susquehanna River	Marietta, Pa	12,000

	1874		Codom's Creek	Susquehanna River	Marietta, Pa	15,000
	Mar. 23, 1880	Ralston, Pa	Trout Run	Susquehanna River	Donegal Springs, Pa	12,000
	Mar. 23, 1880	Huntingdon, Pa	Juniata River	Susquehanna River	Donegal Springs, Pa	11,000
Rhode Island	1873			Backstone River	Ponagansett, R. I	2,000
	1873			Pawcatuck River	Ponagansett, R. I	2,200
	1873			Pawtuxent River	Ponagansett, R. I	2,200
	1874	14 places	Slatersville Branch	Blackstone River	Ponagansett, R. I	4,000
	1874	18 places		Pawcatuck River	Ponagansett, R. I	15,000
	1874	28 places		Pawtuxent River	Ponagansett, R. I	40,000
	1875	31 places		Pawtuxent River	Ponagansett, R. I	10,000
	1875	10 places	Slatersville Branch	Blackstone River	Ponagansett, R. I	5,000
	1876		Slatersville Branch	Blackstone River	Ponagansett, R. I	15,000
	1876	Sundry places	North Branch	Pawtuxent River	Ponagansett, R. I	55,000
	1876	Sundry places	South Branch	Pawtuxent River	Ponagansett, R. I	55,000
Vermont	1873		Winooski River	Lake Champlain	Caledonia, N. Y	3,500
	1873		Lamoille River	Lake Champlain	Caledonia, N. Y	3,500
	1874	Wheelock, Vt	Pasumpsic tributaries	Connecticut River	Westport, Conn	10,000
	1874	Concord, Vt	Connecticut River	Long Island Sound	Westport, Conn	5,000
	1874	Barnet, Vt	Connecticut River	Long Island Sound	Westport, Conn	30,000
	1874	McIndoe's Falls, Vt	Connecticut River	Long Island Sound	Westport, Conn	25,000
	1874		Wells River	Connecticut River	Westport, Conn	25,000
	1874	Newbury, Vt	Connecticut River	Long Island Sound	Westport, Conn	25,000
	1874	Rockingham, Vt	Saxton River	Connecticut River	Westport, Conn	5,000
	1874	Royalton, Vt	White River	Connecticut River	Charlestown, N. H	12,000
	1874	Georgia, Vt	Lamoille River	Connecticut River	Charlestown, N. H	36,000
	1874	Northfield, Vt	Dog River	Connecticut River	Charlestown, N. H	48,000
	1875	Ferrisburgh, Vt	Lewis Creek	Lake Champlain	Charlestown, N. H	24,000
	1875	Manchester, Vt	Battenkill Creek	Hudson River	Charlestown, N. H	47,500
Wisconsin	1873		Menomonee River	Lake Michigan	Waterville, Wis	7,000
	1873	Oconomowoc, Wis	Oconomowoc Lake	Lake Michigan	Waterville, Wis	1,000
	1873	Wauwatosa, Wis	Milwaukee River	Lake Michigan	Waterville, Wis	11,000
	1874		Madison Lake	Rock River	Waterville, Wis	7,500
	1874		Geneva Lake	Illinois River	Waterville, Wis	7,500
	1875	Sheboygan County, Wis	Elkhart Lake	Illinois River	Boscobel, Wis	6,000
	1875	Sheboygan County, Wis	Devil's Lake	Illinois River	Boscobel, Wis	7,000
	1875	Sheboygan County, Wis	Cedar Rock Lake	Illinois River	Boscobel, Wis	7,000

D.—TABLE V.—*Distribution of white-fish from 1872 to 1880, inclusive.*

State.	Date.	Locality.	Tributaries.	Waters stocked.	Where finally hatched.	Number of fish.
California	1872	Lake County, Cal		Clear Lake	State Hatchery	25,000
	1873	Lake County, Cal		Clear Lake		25,000
	Mar. —, 1875	Tulare County, Cal		Tulare Lake	Berkeley, Cal	20,000
	Spring, 1877	Nevada County, Cal		Donner Lake	Berkeley, Cal	75,000
	Spring, 1877	Placer County, Cal		Semeron and other lakes	Berkeley, Cal	50,000
	Spring, 1877			Tahoe Lake	Berkeley, Cal	175,000
	Jan. 11, 1879	Placer County, Cal		Tahoe Lake	San Leandro, Cal	70,000
	Jan. 11, 1879	Nevada County, Cal		Donner Lake	San Leandro, Cal	70,000
	Jan. 11, 1879	Nevada County, Cal		Lakes	San Leandro, Cal	60,000
	Jan. 18, 1879	Lassen County, Cal		Eagle Lake	San Leandro, Cal	225,000
	Jan. 21, 1879	Tulare County, Cal		Tulare Lake	San Leandro, Cal	100,000
	Feb. 1, 1879	Sonoma County, Cal		Mark West Creek	San Leandro, Cal	10,000
	Feb. 17, 1879	Santa Clara County, Cal		San José Water Company's Reservoir.	San Leandro, Cal	10,000
	Feb. 17, 1879	Alameda County, Cal		Chabot Lake	San Leandro, Cal	20,000
Indiana	Mar. 8, 1876	Rome, Ind		Rome City Lake	Northville, Mich	100,000
Iowa	Mar. 1, 1876	Iowa County, Iowa		Clear Lake	Northville, Mich	100,000
Michigan	Feb. 8, 1876	Northville, Mich		Rough River	Northville, Mich	200,000
	Feb. 9, 1876	Northville, Mich		Rough River	Northville, Mich	200,000
	Feb. 15, 1876	Northville, Mich		Rough River	Northville, Mich	200,000
	Feb. 19, 1876	Oak County, Mich		Walled Lake	Northville, Mich	50,000
	Feb. 19, 1876	Oak County, Mich		Strait's Lake	Northville, Mich	35,000
	Feb. 19, 1876	Oak County, Mich		Oxbow Lake	Northville, Mich	40,000
	Feb. 19, 1876	Northville, Mich	Rough River	Yerkes Lake	Northville, Mich	100,000
	Feb. 21, 1876	Le Roy, Mich		Rose Lake	Northville, Mich	25,000
	Feb. 21, 1876	Fife Lake, Mich		Fife Lake	Northville, Mich	25,000
	Feb. 21, 1876	Crofton, Mich		Bass Lake	Northville, Mich	125,000
	Feb. 21, 1876	Crofton, Mich		Loon Lake	Northville, Mich	125,000
	Feb. 21, 1876	Petosky, Mich		Twin Lakes	Northville, Mich	20,000
	Feb. 21, 1876	Petosky, Mich		Round Lake	Northville, Mich	20,000
	Feb. 21, 1876	Petosky, Mich		Crooked Lake	Northville, Mich	20,000
	Feb. 21, 1876	Cheboygan, Mich		Burt's Lake	Northville, Mich	40,000
	Feb. 24, 1876	Dexter, Mich		Silver Lake	Northville, Mich	12,500
	Feb. 24, 1876	Dexter, Mich		Portage Lake	Northville, Mich	20,000
	Feb. 24, 1876	Dexter, Mich		Big Portage Lake	Northville, Mich	20,000
	Feb. 24, 1876	Dexter, Mich		Base Lake	Northville, Mich	20,000
	Feb. 24, 1876	Dexter, Mich		Half-Moon Lake	Northville, Mich	20,000
	Feb. 24, 1876	Dexter, Mich		Patterson Lake	Northville, Mich	20,000
	Feb. 24, 1876	Dexter, Mich		Blind Lake	Northville, Mich	10,000
	Feb. 24, 1876	Dexter, Mich		Bruin Lake	Northville, Mich	10,000
	Feb. 24, 1876	Dexter, Mich		Island Lake	Northville, Mich	10,000
	Feb. 24, 1876	Dexter, Mich		Woodburn Lake	Northville, Mich	10,000
	Feb. 24, 1876	Chelsea, Mich		Round Lake	Northville, Mich	7,500
	Feb. 24, 1876	Chelsea, Mich		Lowe Lake	Northville, Mich	10,000

	Feb. 26, 1876	Linden, Mich		Day Lake	Northville, Mich	25, 000
	Feb. 26, 1876	Linden, Mich		Cooke's Lake	Northville, Mich	10, 000
	Feb. 26, 1876	Linden, Mich		Silver Lake	Northville, Mich	40, 000
	Feb. 26, 1876	Linden, Mich		Round Lake	Northville, Mich	25, 000
	Feb. 28, 1876	New Buffalo, Mich		Lake Michigan	Northville, Mich	130, 000
	Feb. 28, 1876	Battle Creek, Mich		Lakes	Northville, Mich	70, 000
	Spring, 1869	Monroe, Mich				200, 000
New Jersey	Feb. 17, 1879	Morris County, N. J		Shephord's Pond	Bloomsbury, N. J	45, 000
	Feb. 17, 1879	Morris County, N. J		Lake Hopatcong	Bloomsbury, N. J	45, 000
Ohio	Feb. 17, 1876	Toledo, Ohio		Lake Erie	Northville, Mich	100, 000
	Feb. 21, 1876	Toledo, Ohio		Lake Erie	Northville, Mich	500, 000
Wisconsin	1875	Reshena, Wis		Lakes		100, 000
	1876	Reshena, Wis		Lakes		100, 000

D.—TABLE VI.—*Distribution of California trout*, 1880.

State.	Date.	Locality.	Tributaries.	Waters stocked.	Where finally hatched.	Number of fish.
District of Columbia	May 1, 1880	Anacostia, D. C	Pond	Anacostia River	Baltimore, Md	500
Iowa	1880	Anamosa, Iowa	Ponds at Hatchery		Anamosa, Iowa	1,000
Maryland	Apr. 15, 1880		Stream	Gwynn's Falls	Baltimore, Md	500
	Apr. 15, 1880	Buckeystown, Md	Pond	Monocacy River	Baltimore, Md	300
	Apr. 16, 1880	Patuxent, Md	Streams	Little Patuxent River	Baltimore, Md	500
	Apr. 17, 1880	Waverly, Md	Stony Run	Jones Falls	Baltimore, Md	500
	Apr. 17, 1880	Catonsville, Md	Pond	Patapsco River	Baltimore, Md	500
	Apr. 17, 1880	Long Green, Md		Gunpowder River	Baltimore, Md	500
	Apr. 18, 1880	Pikesville, Md	Stream	Gwynn's Falls	Baltimore, Md	500
	Apr. 19, 1880	Green Spring, Md	Pond	Lake Roland	Baltimore, Md	500
	Apr. 19, 1880	Carrollton, Md	Pond	Patapsco River	Baltimore, Md	500
	Apr. 20, 1880		Rocky Run	Patuxent River	Baltimore, Md	500
	Apr. 20, 1880	Airy Hill, Md	Stream	Gwynn's Falls	Baltimore, Md	500
	Apr. 20, 1880	Oakland, Md	Pond	Patuxent River	Baltimore, Md	500
	Apr. 20, 1880		Trout Branch	Patuxent River	Baltimore, Md	500
	Apr. 21, 1880		Pond	Gwynn's Falls	Baltimore, Md	500
	Apr. 21, 1880	New Market, Md	Bush Creek	Monocacy River	Baltimore, Md	500
	Apr. 21, 1880	Unionville, Md	Pond	Linganore River	Baltimore, Md	500
	Apr. 21, 1880	New Market, Md	Bush Creek	Monocacy River	Baltimore, Md	500
	Apr. 22, 1880	Wilna, Md	Plum Tree Run	Bush River	Baltimore, Md	500
	Apr. 22, 1880	Phœnix, Md	Stream	Great Gunpowder River	Baltimore, Md	500
	Apr. 22, 1880	Phœnix, Md	Stream	Great Gunpowder River	Baltimore, Md	500
	Apr. 22, 1880	Phœnix, Md	Stream	Great Gunpowder River	Baltimore, Md	500
	Apr. 26, 1880	Westminster, Md	Pond	Pipe Creek	Baltimore, Md	500
	Apr. 26, 1880	Westminster, Md	Pond	Patapsco River	Baltimore, Md	500
	Apr. 27, 1880	Arlington, Md	Stream	Gunpowder River	Baltimore, Md	500
	Apr. 27, 1880	Dripping Spring, Md	Gunpowder River	Patuxent River	Baltimore, Md	1,000
	Apr. 28, 1880	Clear Spring, Md	Frantz Mill Dam	Potomac River	Baltimore, Md	500
	Apr. 28, 1880	Bel Air, Md	Stony Branch	Bush River	Baltimore, Md	500
	Apr. 30, 1880	Eden, Md	Pond	Patapsco River	Baltimore, Md	500
	May 1, 1880	Baltimore, Md	Stream	Patuxent River	Baltimore, Md	500
	May 3, 1880	Uniontown, Md	Pond	Big Pipe Creek	Baltimore, Md	500
	May 4, 1880	White Hall, Md	Pond	Gunpowder River	Baltimore, Md	500
	May 4, 1880		Stream		Baltimore, Md	500
	May 7, 1880	Govanstown, Md	Stream	Back River	Baltimore, Md	500
	May 8, 1880	Norrisville, Md	McDonald's Run	Deer Creek	Baltimore, Md	500
	May 11, 1880	Frederick, Md	Monocacy River	Potomac River	Baltimore, Md	500
	May 13, 1880	Mount Pleasant, Md	Pond	Monocacy River	Baltimore, Md	500
	May 15, 1880	Baltimore, Md	Pond	Gunpowder River	Baltimore, Md	500
	May 17, 1880	Warren, Md		Gunpowder River	Baltimore, Md	500
	May 18, 1880	Sulphur Spring, Md	Pond	Patapsco River	Baltimore, Md	500
	May 18, 1880	Sykesville, Md	Stream	Potomac, West Branch	Baltimore, Md	500
	May 18, 1880	Fairview, Md	Bush Run	Conococheague River	Baltimore, Md	2,500
	May 19, 1880	Ijamsville, Md	Pond	Monocacy River	Baltimore, Md	500

	May 20, 1880	Baltimore, Md	Stony Run	Jones Falls	Baltimore, Md	500
	May 21, 1880	Ellicott City, Md	Stream	Patapsco River	Baltimore, Md	500
	May 21, 1880	Ellicott City, Md		Patapsco River	Baltimore, Md	500
	May 24, 1880	York Road, Md	Pond	Gunpowder River	Baltimore, Md	500
	May 25, 1880	Greenwood, Md	Pond	Gunpowder River	Baltimore, Md	500
	May 27, 1880	Sandy Spring, Md	Stream	Patuxent River	Baltimore, Md	500
	May 29, 1880	Saint James, Md	Pond	Gunpowder River	Baltimore, Md	500
	May 29, 1880	Rockville, Md	Rock Creek	Potomac River	Baltimore, Md	5,000
	May 31, 1880	Barnesville, Md	Pond	Monocacy River	Baltimore, Md	500
	June 1, 1880	Port Deposit, Md	Pond	Susquehanna River	Baltimore, Md	500
	June 1, 1880	Port Deposit, Md	Pond	Susquehanna River	Baltimore, Md	500
	June 4, 1880	Monrovia, Md	Pond	Bennett's Creek	Baltimore, Md	500
	June 14, 1880	Dickerson, Md	Pond	Potomac River	Baltimore, Md	200
	June 15, 1880	Ijamsville, Md	Pond	Bush Creek	Baltimore, Md	500
	June 24, 1880		Stream	Western Run	Baltimore, Md	500
	1880	Bella Vista, Md	Pond	Gunpowder River	Baltimore, Md	500
Michigan	1880	Northville, Mich	Ponds	Rouge River	Pokagon, Mich	2,100
	1880	Almena, Mich	North Branch	Paw Paw River	Pokagon, Mich	684
	1880	Charlevoix County, Mich		Boyne River	Pokagon, Mich	684
	June 25, 1880	Pokagon, Mich	Ponds at Hatchery		Pokagon, Mich	684
	1880	Battle Creek, Mich	Sheppard's Brook	Kalamazoo River	Battle Creek, Mich	750
	1880	Battle Creek, Mich	Ponds at Hatchery		Battle Creek, Mich	200
Minnesota	1880	Willow Brook, Minn	Ponds at Hatchery			1,900
New Hampshire	1880	Plymouth, N. H	Baker's River	Pemigewasset River		1,000
	1880	Plymouth, N. H	Pemigewasset River	Merrimac River		1,000
North Carolina	Mar. 22, 1880	Watauga County, N. C	Ponds	New River		500
	Mar. 22, 1880	McDowell County, N. C	Mill Creek	Catawba River		1,000
	Mar. 22, 1880	Buncombe County, N. C	Swannuca River	French Broad River		500
	Mar. 22, 1880	Buncombe County, N. C	Ponds	French Broad River		800
	Mar. 22, 1880	Burke County, N. C	Upper Creek	Catawba River		500
	Mar. 22, 1880	Burke County, N. C	John's River	Catawba River		1,000
Pennsylvania	1880	Corry, Pa	Ponds at Hatchery			700
South Carolina	1880		Seneca River			1,500
	1880		Mill Creek			1,000
	1880		Hampton Creek			1,000
West Virginia	1880	Romney, W. Va	Mill Run	South Branch Potomac River		500
Wisconsin	1880	Geneva, Wis	Ponds	Geneva Lake		2,500

XIX.—INDEX TO THE DISTRIBUTION, MADE UNDER THE AUSPICES OF THE UNITED STATES FISH COMMISSION, OF FISH IN PUBLIC WATERS OF THE UNITED STATES, DURING THE DECADE ENDING 1880.

By Chas. W. Smiley.

Note.—To ascertain whether fish have been deposited in any given locality, look either for the name of the stream or for names of places or counties at the headwaters of that stream. In many cases deposits were made at railroad bridges at some distance from villages or post-offices. In these cases the effort has been made to give the name of the nearest post-office. For fuller particulars of deposits, see the tables of distribution, pages 843 to 915, inclusive, of this volume.

Abbeville, Miss., Yazoo River. California salmon, 1876; shad, 1876.
Aberdeen, Md., Archer's Run. California salmon, 1876.
Aberdeen, Md., Green Spring Run. California salmon, 1876.
Aberdeen, Md., Tobacco Run. California salmon, 1876.
Aberdeen, Miss., Tombigbee River. Shad, 1878.
Acton, Mass., Magog Lake. Schoodic salmon, 1879.
Acworth, N. H., Cold Pond. Schoodic salmon, 1880.
Adair County, Ky., Russell Creek. California salmon, 1876.
Adams Pond, Sandwich, N. H. Schoodic salmon, 1880.
Addison County, Vt. (See Ferrisburgh, Vt.; Orwell, Vt.; Salisbury, Vt.; Vergennes, Vt.)
Airey's, Md., Patuxent River. California salmon, 1879.
Airey's, Md., Transquaking River. California salmon, 1879; shad, 1879.
Airy Hill, Baltimore County, Md., Gwynn's Falls. Schoodic salmon, 1880; California trout, 1880.
Alabama River, Montgomery, Ala. California salmon, 1876; shad, 1876.
Alabama River. (See tributaries: Tallapoosa River and Coosa River.)
Alamance County, N. C., Haw River. Shad, 1877.
Alamance County, N. C. (See Graham, N. C.)
Alameda County, Cal., Lake Chabot. Schoodic salmon, 1878; whitefish, 1879.
Alameda County, Cal., Arroyo Laguna. Schoodic salmon, 1878.
Albany, Ga., Flint River. Shad, 1878, 1880.
Albemarle County, Va. (See Shadwell, Va.)
Albemarle Sound, Roanoke River Light, near Avoca, N. C. Shad, 1879.
Albemarle Sound, Scotch Hall Fishery, Avoca, N. C. Shad, 1878, 1878, 1879.

Albert Lea, Freeborn County, Minn. Penobscot salmon, 1875; California salmon, 1875, 1876.
Alden Lake, Freeborn County, Minn. California salmon, 1878.
Allamakee County, Iowa. (See Waukon, Iowa.)
Allapahaw River, Stockton, Ga. Shad, 1879.
Allegan County, Mich., Dumont Lake. California salmon, 1878.
Allegan County, Mich., Minckler Lake. California salmon, 1879.
Allegan County, Mich., Minor Lake. California salmon, 1878, 1879.
Allegan County, Mich., Sixteen Lake. California salmon, 1879.
Allegan County, Mich., Wetmore Lake. California salmon, 1879.
Alleghany County, Md. (See Cumberland, Md.; Tannery, Md.)
Alleghany County, Va., Jackson River. California salmon, 1876.
Alleghany County, Va. (See Clifton Forge, Va.)
Alleghany Springs, Va., Roanoke River. California salmon, 1880.
Allegheny River, Salamanca, N. Y. Shad, 1872.
Allegheny River. (See tributary: Chautauqua Lake.)
Allegheny River, Westmoreland County, Pa. Schoodic salmon, 1880.
Allen Creek, Monroe County, N. Y. California salmon, 1873, 1874, 1875; Penobscot salmon, 1875; Schoodic salmon, 1879.
Alley Lake, Renville County, Minn. California salmon, 1879; Schoodic salmon, 1879.
Alloway's Creek, Allowaystown, N. J. California salmon, 1876, 1877, 1879.
Allowaystown, N. J., Alloway's Creek. California salmon, 1876, 1877, 1879.
Almena, Mich., North Branch of Paw-Paw River. California trout, 1880.
Alone, Va., Buffalo Creek. California salmon, 1880.
Altamaha River. (See tributaries: Oconee River and Ocmulgee River.)
Amherst County, Va., Pedlar River. California salmon, 1876.
Amite City, La., Tangipahoa River. California salmon, 1876.
Amite River, Tickfaw, La. Shad, 1878.
Anacostia, D. C., pond. California trout, 1880.
Anamosa, Iowa, Hatching Ponds. California trout, 1880; Schoodic salmon, 1878.
Anamosa, Iowa, Wapsipinicon River. California salmon, 1874, 1875.
Andover Branch, Millington, Md. California salmon, 1879.
Andover, Sussex County, N. J., Strubel's Lake. Schoodic salmon, 1878.
Androscoggin County, Me. (See Auburn, Me.)
Androscoggin River, Me., tributary of. Penobscot salmon, 1873.
Anne Arundel County, Md. (See Patuxent, Md.; Sappington, Md.)
Anoka County, Minn., Crooked Lake. California salmon, 1877.
Anoka County, Minn., Round Lake. California salmon, 1877.
Anthony's Pond, Wis. California salmon, 1879.
Antietam Creek, Chewsville, Md. California salmon, 1876.
Antietam Creek, Hagerstown, Md. California salmon, 1874, 1876, 1879.

Antrim, N. H., sundry ponds. Schoodic salmon, 1879.
Appalachicola River. (See tributaries: Chattahoochee River, Flint River, and Chastatee River.)
Appleton, Wis., Fox River. Shad, 1873, 1877.
Appomattox River, Farmville, Va. Schoodic salmon, 1879.
Appomattox River, Prospect, Va. California salmon, 1880.
Appomattox River, Petersburgh, Va. Shad, 1878, 1880.
Appoquinimink Creek, Blackbird, Del. Shad, 1879.
Aquetong Lake, Salisbury, Bucks County, Pa. Schoodic salmon, 1878.
Arapahoe County, Colo. (See Denver, Colo.)
Arcadia, Mo., Saint Francis River. Shad, 1879.
Archer's Run, Aberdeen, Md. California salmon, 1876.
Arkadelphia, Ark., Caddo River. Shad, 1878.
Arkadelphia, Ark., Quactuto River. California salmon, 1878.
Arkansas River, Little Rock, Ark. California salmon, 1878.
Arkansas River. (See tributaries: Neosho, Little Arkansas, Cow, Walnut, Pawnee, and Spring Rivers, and Shoal Creek.)
Arlington Heights, Ill., Small Lake. California salmon, 1877.
Arlington, Md., stream. California trout, 1880.
Armstrong Lake, Hennepin County, Minn. California salmon, 1877.
Aroostook County, Me. (See Bancroft, Me.)
Aroostook County, Me., Drew's Lake. Schoodic salmon, 1878.
Aroostook County, Me., Limerick Lake. Schoodic salmon, 1878.
Arroyo Laguna, Alameda County, Cal. Schoodic salmon, 1878.
Ashburnham, Mass., Nankeag Lake. Schoodic salmon, 1876, 1877, 1878, 1879, 1880.
Ash Creek, Ellsworth, Kans. Schoodic salmon, 1880.
Asher's Creek, Taylorsville, Ky. Schoodic salmon, 1878.
Asheville, N. C., Pigeon River. California salmon, 1877.
Ashley Pond, Holyoke, Mass. Schoodic salmon, 1878, 1879.
Ashtabula County, Ohio. (See Ashtabula, Ohio.)
Ashtabula County, Ohio. (See Eagleville, Ohio.)
Ashtabula, Ohio, Ashtabula River. Shad, 1873.
Ashtabula River, Ashtabula, Ohio. Shad, 1873.
Asnaconconic Pond, Hubbardston, Mass. Schoodic salmon, 1878, 1879.
Asnebumskitt Pond, Paxton, Mass. Schoodic salmon, 1879.
Assawampsett Lake, Middleborough, Mass. Schoodic salmon, 1877, 1878, 1879.
Athens, Tenn., Eastanalbee River. California salmon, 1876; shad, 1876.
Athol, Mass. Schoodic salmon, 1876.
Atkin's Tank, Va., South Fork of Holston River. California salmon, 1880.
Atlanta, Ga., Chattahoochee River. Shad, 1876.
Atlantic County, N. J. (See Egg Harbor City, N. J., May's Landing, N. J., Weymouth, N. J.
Atlantic County, N. J., Great Egg Harbor River. California salmon, 1879.

Atlantic, Iowa, Nishnabottomy River. California salmon, 1875.
Attala County, Miss. (See Kosciusko, Miss.)
Auburn, Me., pond. Schoodic salmon, 1879.
Audrain County, Mo. (See Mexico, Mo.)
Auglaize County, Ohio. (See Wapakoneta, Ohio.)
Auglaize River, Wapakoneta, Ohio. California salmon, 1875.
Augusta County, Va. (See Greenville, Va., Staunton, Va., Waynesborough, Va.)
Au Sable River, Crawford County, Mich. California salmon, 1874, 1876.
Au Sable River, Roscommon County, Mich. Penobscot salmon, 1873.
Au Sable River. (See tributary: Otsego Lake.)
Austin, Minn., Mill Pond. California salmon, 1877.
Austin, Texas, Colorado River. Shad, 1874, 1875, 1879; California salmon, 1874, 1876.
Avoca, N. C., Chowan River. Shad, 1878.
Avoca, N. C., near Roanoke River Light, 1879.
Avoca, N. C., Salmon Creek. Shad, 1878, 1879.
Avoca, N. C., Scotch Hall Fishery, Albemarle Sound. Shad, 1878, 1879.
Avon, Minn., Spunk Creek. California salmon, 1877.
Back River, Herring Run, Md. California salmon, 1878.
Badger River, Iowa. California salmon, 1878.
Baird, Cal., McCloud River. California salmon, 1873, 1874, 1875, 1876, 1877, 1878, 1879, 1880.
Baker's River, N. H. California salmon, 1875.
Baker's River, Plymouth, N. H. California salmon, 1878; California trout, 1880.
Baker's River, Warren, N. H. California salmon, 1876; Penobscot salmon, 1876.
Balahack Brook, South Windham, Conn. Schoodic salmon, 1877.
Bald Eagle Creek. (See tributary: Spring Creek.)
Bald Eagle Lake, Ramsey County, Minn. California salmon, 1876.
Bald Eagle River, Bellefonte, Pa. California salmon, 1874.
Balding's Mill, Ga., Chastatee River. California salmon, 1878.
Baldwin County, Ga. (See Milledgeville, Ga.)
Baltimore County, Md., Railroad Crossing of Gunpowder River. Shad, 1879.
Baltimore County, Md. (See Airy Hill, Md.; Arlington, Md.; Baltimore, Md.; Catonsville, Md.; Cockeysville, Md.; Dripping Spring, Md.; Freeland, Md.; Glencoe, Md.; Green Spring, Md.; Greenwood, Md.; Govanstown, Md.; Hampton, Md.; Hereford, Md.; Herring Run, Md.; Long Green, Md.; Monkton, Md.; Parkton, Md.; Phœnix, Md.; Pikesville, Md.; Reisterstown, Md.; Relay Station, Md.; Saint James, Md.; Towsontown, Md.; Warren, Md.; Waverly, Md.; White Hall, Md.)
Baltimore, Md., Baltimore Water Works. California salmon, 1876, 1876.
Baltimore, Md., Beaver Dam Creek. Schoodic salmon, 1879.
Baltimore, Md., Charles River. Schoodic salmon, 1879.

Baltimore, Md., Charles Street Avenue Lake. Schoodic salmon, 1879.
Baltimore, Md., Druid Hill Lake. Schoodic salmon, 1879.
Baltimore, Md., Patuxent River. Schoodic salmon, 1880.
Baltimore, Md., pond. California trout, 1880; Schoodic salmon, 1880.
Baltimore, Md., Stony Run. California trout, 1880.
Baltimore, Md., stream. California trout, 1880.
Baltimore, Md., Trout Branch. Schoodic salmon, 1880.
Baltimore Water-Works, Baltimore, Md. California salmon, 1876, 1876.
Bancroft, Me., Mattawamkeag River. Penobscot salmon, 1875, 1876.
Bantam Lake, Litchfield, Conn. Schoodic salmon, 1876, 1877, 1878, 1879.
Baptist Seminary Pond, Kalamazoo, Mich. California salmon, 1875.
Barbour County, W. Va., Tygert's Valley River. California salmon, 1879, 1880.
Barnesville, Md., pond. California trout, 1880.
Barnet, Vt., Harvey's Pond. Schoodic salmon, 1876, 1878.
Barnet, Vt., Connecticut River. Penobscot salmon, 1874.
Barn's Farm, Md., Blackwater River. California salmon, 1879.
Barnstable County, Mass. (See Brewster, Mass.; Cotuit, Mass.; Falmouth, Mass.; Mashpee, Mass.; North Sandwich, Mass.; Sandwich, Mass.; Wellfleet, Mass.; Yarmouth, Mass.)
Barnum pond, Houston County, Minn. Schoodic salmon, 1879.
Baro Beeso Lake, Hillsdale, Mich. California salmon, 1878.
Barren Lake, Mich. Penobscot salmon, 1873.
Barren River, Warren County, Ky. California salmon, 1877, 1878; shad, 1878.
Barret's Pond, Wythe County, Va. Schoodic salmon, 1880.
Barrett, Kans., Clear Creek. California salmon, 1878, 1879.
Barrier Lake, Hillsdale County, Mich. Penobscot salmon, 1873.
Barrington River, Bristol County, R. I. Shad, 1875, 1877.
Barron Lake, Cass County, Mich. California salmon, 1875, 1879.
Barron Lake, Howard, Mich. California salmon, 1878.
Barry County, Mich., Carter Lake. California salmon, 1875.
Barry County, Mich., Long Lake. California salmon, 1875.
Barry County, Mich., Thorn Apple Lake. California salmon, 1875.
Barry Hunt's Lake, Rice County, Minn. Penobscot salmon, 1875.
Bartholomew County, Ind. (See Columbus, Ind.)
Bartlett's Pond, Parkersburg, W. Va. Schoodic salmon, 1878.
Barton County, Kans. (See Great Bend, Kans.)
Barton Pond, Barton, Vt. Schoodic salmon, 1876.
Barton, Vt., Bellwater Pond. Schoodic salmon, 1878.
Bartow County, Ga. (See Cartersville, Ga.)
Base Lake, Dexter, Mich. Whitefish, 1876.
Baskahegan, tributary of, Maine. Penobscot salmon, 1874.
Bass Lake, Crofton, Mich. Whitefish, 1876.
Bass Lake, Faribault County, Minn. California salmon, 1876, 1877.

Bass Lake, Ramsey County, Minn. Schoodic salmon, 1875; California salmon, 1875; Penobscot salmon, 1875.
Bass Lake, Washington County, Minn. California salmon, 1877.
Battenkill Creek, Manchester, Vt. Penobscot salmon.
Battery Light, Md., Susquehanna River. Shad, 1879.
Battle Creek, Calhoun County, Mich., Goquack Lake. California salmon, 1875; Schoodic salmon, 1878.
Battle Creek, Mich., Hamblin Lake. California salmon, 1876.
Battle Creek, Mich., lakes. Whitefish, 1876; California trout, 1880.
Battle Creek, Mich., Sheppard's Brook. California trout, 1880.
Bayard, Ohio, Muskingum River. Shad, 1875.
Bay County, Mich., Rifle River. California salmon, 1875.
Bay, Erie, Pa. Schoodic salmon, 1879.
Bayou Macon, Railroad Crossing, Richland Parish, La. Shad, 1879.
Baytown Lake, Wright County, Minn. California salmon, 1876.
Beach Pond, Richmond, R. I. Schoodic salmon, 1876.
Beach Pond, Voluntown, Conn. Schoodic salmon, 1876.
Bean Pond, Warner, N. H. Schoodic salmon, 1880.
Bean's Lake, Platte County, Mo. California salmon, 1880.
Bear Creek, Charlevoix County, Mich. California salmon, 1876, 1876.
Bear Creek, Iowa, Bear Creek. Penobscot salmon, 1875.
Bear Creek, tributary of, Md. California salmon, 1878.
Bear Hill Pond, Harvard, Mass. Schoodic salmon, 1878, 1879.
Bear Lake, Carleton County, Minn. California salmon, 1878.
Bear Lake, Wilkes Barre, Pa. California salmon, 1880; Schoodic salmon, 1878, 1880.
Bear River. (See tributary: Truckee River.)
Beaver Creek, N. Y. California salmon, 1873.
Beaver Creek, Sand Bank, N. Y. California salmon, 1874.
Beaver County, Pa. (See Georgetown, Pa.)
Beaver Dam Creek, Baltimore, Md. Schoodic salmon, 1879.
Becker County, Minn., Detroit Lake. California salmon, 1877; Schoodic salmon, 1875; Penobscot salmon, 1875.
Becker County, Minn. (See Frazee City, Minn.; Lake Park, Minn.)
Bel Air, Md., pond. Schoodic salmon, 1880.
Bel Air, Md., Stony Branch. California trout, 1880.
Belknap County, N. H. (See Centre Harbor, N. H.; Tilton, N. H.)
Bella Vista, Md., pond tributary to Gunpowder River. California trout, 1880.
Bell Creek, Goodhue County, Minn. California salmon, 1878.
Bellefontaine, Ohio, Buckingahela River. Shad, 1874.
Bellefonte, Pa., Bald Eagle River. California salmon, 1874.
Bellefonte, Pa., Spring Creek. California salmon, 1874.
Belleville, Ill., Kaskaskia River. California salmon, 1877.
Belleville, Ill., Mississippi River. California salmon, 1877.
Belleville, Ill., Prairie du Pont River. California salmon, 1876, 1877.

Bellows Falls, Vt., Connecticut River. Shad, 1874, 1874, 1874, 1876.
Bellton, W. Va., Fish Creek. California salmon, 1879, 1880.
Bellwater Pond, Barton, Vt. Schoodic salmon, 1878.
Beloit, Kans., Solomon River. California salmon, 1878, 1879.
Bennington County, Vt., ponds. Schoodic salmon, 1876.
Bennington County, Vt. (See Manchester, Vt.)
Benson, Minn., Chippewa River. California salmon, 1877.
Benton, Ark., Saline River. Shad, 1878; California salmon, 1878.
Benton Creek, Fillmore County, Minn. California salmon, 1878.
Benton Harbor, Mich., private ponds. California salmon, 1878.
Benton, N. H., Long Pond. Schoodic salmon, 1880.
Bergen County, N. J., Hackensack River. California salmon, 1879.
Bergen County, N. J., lakes. Schoodic salmon, 1879.
Berks County, Pa. (See Reading, Pa.)
Berkshire County, Mass. (See Great Barrington, Mass.; Otis, Mass.; Pittsfield, Mass.; Stockbridge, Mass.)
Berlin, Md., Herring Creek. California salmon, 1879.
Berlin, Md., Saint Michael's River. Shad, 1879.
Berlin, Md., Trappe River. California salmon, 1879, 1880.
Berlin, Mass., Gates Pond. Schoodic salmon, 1876, 1877.
Berrien County, Mich., Saint Joseph River. California salmon, 1879.
Berrien County, Mich. (See Benton Harbor, Mich.; New Buffalo, Mich.; Niles, Mich.; Saint Joseph, Mich.; Watervliet, Mich.)
Berry Pond, Pittsfield, N. H. Schoodic salmon, 1880.
Bertie County, N. C. (See Avoca, N. C.; Colerain, N. C.; The Mill, N. C.)
Bethany, W. Va., Buffalo Creek. California salmon, 1878, 1879, 1880.
Bexar County, Tex. (See San Antonio, Tex.)
Bibb County; Ga. (See Macon, Ga.)
Big Black River, Canton, Miss. Shad, 1877.
Big Black River, Vaughan, Miss. Shad, 1878.
Big Black River, Piedmont, Mo. Shad, 1879.
Big Black River, Poplar Bluff, Mo. Shad, 1879.
Big Blue River, Blue Rapids, Kans. California salmon, 1878, 1879.
Big Blue River, Manhattan, Kans. California salmon, 1878, 1879, 1880.
Big Blue River, Topeka, Kans. Shad, 1877.
Big Blue River. (See tributaries: Little Blue River and Black Vermillion River.)
Big Butts Lake, Ramsey County, Minn. California salmon, 1876.
Big Creek, Ellis, Kans. California salmon, 1878, 1879.
Big Creek, Hayes City, Kans. California salmon, 1878, 1879.
Big Elk River, Saint Mark's, Md. California salmon, 1879.
Big Elk River, Saintman's Mill, Md. California salmon, 1878, 1880.
Big Gunpowder River, Parkton, Md. California salmon, 1879.
Big Hatchie River, Brownsville, Tenn. Shad, 1876.
Big Lake, Pine County, Minn. California salmon, 1875.
Big Lake, Sherburne County, Minn. California salmon, 1876.

Bigler Lake. (See tributary: Tahoe Lake.)
Big Paw-Paw River, Watervliet, Mich. California salmon, 1878.
Big Pipe Creek, tributary to, Union Bridge, Md., pond. Schoodic salmon, 1879.
Big Pipe Creek, Middleburg, Md. California salmon, 1879.
Big Pond, White Haven, Pa. Schoodic salmon, 1879.
Big Portage Lake, Dexter, Mich. Whitefish, 1876.
Big Rock Creek, Big Rock, Iowa. California salmon, 1874.
Big Rock Creek, Walker, Iowa. California salmon, 1875.
Big Rock, Iowa, Big Rock Creek. California salmon, 1874.
Big Rock River, Iowa. California salmon, 1879.
Big Sandy River. (See tributary: Tygert River.)
Big Slate Creek, Montgomery County, Ky. California salmon, 1877.
Big Spring Branch, Scott County, Ky. California salmon, 1876.
Big Spring Depot, Va., Roanoke River. California salmon, 1876, 1880.
Big Star Lake, Lake County, Mich. California salmon, 1876.
Big Stone County, Minn. (See Ortonville, Minn.)
Big Stone Lake, Ortonville, Minn. California salmon, 1880.
Big Wills Creek, Lebanon, Ala. Shad, 1879.
Billerica, Mass., Shawshine River. Schoodic salmon, 1877.
Bingham Lake, Cottonwood County, Minn. California salmon, 1876.
Blackbird, Del., Appoquinimink River. Shad, 1879.
Black Hawk County, Iowa. (See Waterloo, Iowa.)
Black River, Elyria, Ohio. Shad, 1874.
Black River, Poplar Bluff, Mo. Shad, 1876.
Black River, Port Huron, Mich. California salmon, 1875.
Black River, Wayne County, Mo. California salmon, 1879.
Black River, S. C. California salmon, 1880.
Black River. (See tributary: Ouachita, or Washita, River.)
Black River. (See tributary: San Francois River.)
Black River. (See tributary: Bowell Creek.)
Blacksburgh, Va., New River. Schoodic salmon, 1878.
Blacksmith's Fork, Cache County, Utah. California salmon, 1876.
Blackstone River, R. I. Penobscot salmon, 1873.
Blackstone River, Providence County, R. I. Shad, 1874, 1877.
Blackstone River. (See tributary: Slatersville Branch.)
Blackstone River, tributary of, R. I. California salmon, 1874, 1875.
Black Vermillion River, Frankford, Kans. California salmon, 1878, 1879.
Black Warrior River, Tuscaloosa, Ala. Shad, 1879.
Blackwater River, Barn's Farm, Md. California salmon, 1879.
Blackwater River, Cambridge, Md. California salmon, 1879; shad, 1879.
Blackwater River, Franklin, Va. Shad, 1878, 1879.
Blair County, Pa., Juniata River. California salmon, 1880.
Blair County, Pa. (See Tyrone, Pa.)

Bland County, Va. (See Sharon Springs, Va.)
Blind Lake, Dexter, Mich. Whitefish, 1876.
Bloody Run, McGregor, Iowa. California salmon, 1874.
Bloomfield, N. J., Greenwood Lake. California salmon, 1876, 1877.
Bloomsbury, N. J., Musconetcong River. California salmon, 1874.
Bloomsbury, N. J., Pohatcong River. California salmon, 1874.
Blue Earth County, Minn., Clear Lake. California salmon, 1877.
Blue Earth County, Minn., Crystal Lake. California salmon, 1877, 1880.
Blue Earth County, Minn., Eagle Lake. California salmon, 1876.
Blue Earth County, Minn., Lake Laura. California salmon, 1876.
Blue Earth County, Minn., Loon Lake. California salmon, 1876, 1877.
Blue Earth County, Minn., Madison Lake. California salmon, 1876, 1877.
Blue Earth County, Minn., Minnesota River. California salmon, 1878.
Blue Earth County, Minn. (See Mankato, Minn.)
Blue Earth River. (See tributary: Chain Lake.)
Blue Lake, Kalkaska County, Mich. California salmon, 1879.
Blue Ponds. (See tributary: Spring Creek.)
Blue Rapids, Kans., Big Blue River. California salmon, 1878, 1879.
Blue River, Manhattan, Kans. Shad, 1879.
Blue River, Independence, Mo. California salmon, 1880.
Bluff Creek, Bluffville, Kans. Schoodic salmon, 1880.
Boardman River. (See tributary: Salmon Creek.)
Boeuf River R. R. Crossing, Richland County, La. Shad, 1879.
Bohemia Bridge, Md., Bohemia Creek. California salmon, 1876.
Bohemia Creek, Bohemia Bridge, Md. California salmon, 1876.
Bohemia River, Cecil County, Md. California salmon, 1879, 1880.
Bohemia River, Middletown, Md. Shad, 1879.
Bohemia River, Md. Shad, 1877.
Bois des Sioux River, Forks of Otter Tail, Stevens County, Minn. California salmon, 1877.
Bolton, Conn., Bolton Reservoir. Schoodic salmon, 1880.
Bolton Reservoir, Bolton, Conn. Schoodic salmon, 1880.
Boltonville, Ga., Chattahoochee River. Shad, 1880.
Booker's Branch, Green County, Ky. California salmon, 1877.
Boone, Boone County, Iowa, Des Moines River. Schoodic salmon, 1878.
Boone County, Iowa. (See Boone, Iowa; Moingona, Iowa.)
Boone River, Iowa. California salmon, 1879.
Boone River, Webster City, Iowa. California salmon, 1875.
Boothe's Creek, Walworth County, Wis. California salmon, 1878.
Borden Pond, Fall River, Mass. Schoodic salmon, 1878.
Borgne Lake. (See tributary: Pearl River.)
Boscawen, N. H., Walker's Pond. Schoodic salmon, 1880.
Boscobel, Wis., streams. California salmon, 1877, 1878.
Botetourt County, Va., streams. California salmon, 1879.

Botetourt County, Va., tributary of James River. California salmon, 1876.
Botetourt County, Va. (See Fincastle, Va.)
Bourbon County, Ky., Elmwood Creek. California salmon, 1878.
Bowell Creek, Jefferson County, N. Y. California salmon, 1878.
Bowling Green, Ky., Green River. Shad, 1878.
Bowman's Run, Wilkes Barre, Pa. California salmon, 1876, 1878, 1879.
Box Elder County, Utah, Box Elder Creek. California salmon, 1876.
Box Elder Creek, Box Elder County, Utah. California salmon, 1876.
Boxford, Mass., Mitchell's Pond. Schoodic salmon, 1876, 1877.
Boyd's, Md., Brick Lodge. California salmon, 1878.
Boyd's, Md., Little Lorrem. California salmon, 1878.
Boyd's, Md., Ten-Mile Creek. California salmon, 1878.
Boyer River, Iowa. Penobscot salmon, 1876.
Boyer River, Logan, Iowa. Shad, 1878.
Boyle County, Ky., Dick's River. California salmon, 1876.
Boyne Falls, Mich., Boyne River. California salmon, 1876.
Boyne River, Boyne Falls, Mich. California salmon, 1876.
Boyne River, Charlevoix County, Mich. California trout, 1880.
Bradford, N. H., Bradford's Pond. Schoodic salmon, 1879.
Bradford's Pond, Bradford, N. H. Schoodic salmon, 1879.
Bradley Springs, Trivoli, Kans. Schoodic salmon, 1880.
Brainerd, Crow Wing County, Minn. Penobscot salmon, 1875.
Braintree, Mass., Great Pond. Schoodic salmon, 1877, 1878, 1880.
Branch County, Mich., Coldwater Lake. California salmon, 1875.
Branch County, Mich., Lake of the Woods. California salmon, 1875.
Branch County, Mich., Morrison Lake. California salmon, 1875.
Branchville, N. C., Meherrin River. Shad, 1878, 1879.
Branchville, S. C., Edisto River. California salmon, 1877.
Brandywine, Pa., Brandywine Creek. California salmon, 1876.
Branford, Conn., Roger's Pond. Schoodic salmon, 1877.
Brazos River, Hearne, Tex. Shad, 1879.
Brazos River, Hempstead, Tex. Shad, 1874.
Brazos River. (See tributary: Clear Creek.)
Breckenridge, Minn., Red River of the North. California salmon, 1875; Penobscot salmon, 1875; Schoodic salmon, 1875.
Breckenridge, Minn., branch of Red River. California salmon, 1876.
Bremen County, Iowa. (See Waverly, Iowa.)
Brewster, Mass., ponds. Schoodic salmon, 1880.
Brick Lodge, Boyd's, Md. California salmon, 1878.
Bridgeton, N. J. Cohansey Creek. California salmon, 1877.
Bridgewater, Mass., Fall River. California salmon, 1877.
Bridgewater, Mass., Taunton River. Shad, 1876, 1877.
Bridgewater, N. H., Newfound Lake. Schoodic salmon, 1879.
Bridgewater, N. C., Linville River. California salmon, 1878, 1879.
Briggs Lake, Sherburne County, Minn. California salmon, 1877, 1878.

Bristol County, Mass. (See Fall River, Mass.)
Bristol County, R. I., Barrington River. Shad, 1875, 1877.
Bristol County, R. I., Warren River. Shad, 1874, 1875, 1877.
Bristol County, R. I. (See Warren, R. I.)
Broad Brook, Broad Brook, Conn. Schoodic salmon, 1880.
Broad Brook, Conn., Broad Brook. Schoodic salmon, 1880.
Broad River, Columbia, S. C. California salmon, 1879; shad, 1878, 1880, 1880.
Broad River, Gaffney City, S. C. Shad, 1875, 1880; California salmon, 1877.
Broad River, Hickory-nut Gap, N. C. California salmon, 1879.
Broad River, Marion, N. C. California salmon, 1877.
Broad River, Spartanburgh C. H., S. C. Shad, 1876.
Broad River, S. C. California salmon, 1880.
Broad River. (See tributary: Green River.)
Broad River. (See tributaries: Packlittle River, Enoree River, Little River.)
Broad Run, Broad Run Station, Va. California salmon, 1876.
Broad Run Station, Va., Broad Run. California salmon, 1876.
Brodhead, Wis., Sugar River. California salmon, 1879.
Brooke County, W. Va. (See Bethany, W. Va.)
Brookfield, Conn., Still River. Schoodic salmon, 1880.
Brookfield, N. H., Cook's Pond. California salmon, 1879.
Brooklyn, Mich., Raisin River. California salmon, 1875.
Brooklyn, N. Y., Brooklyn Water-works. California salmon, 1874.
Brooklyn Water-works, Brooklyn, N. Y. California salmon, 1874.
Brookville, Kans., Spring Creek. California salmon, 1878, 1879.
Brown County, Minn., Clear Lake. California salmon, 1878.
Brown County, Minn., Hansca Lake. California salmon, 1878.
Brown County, Minn., Sleepy Eye Lake. California salmon, 1878.
Brown's Creek, Owen, Ill. California salmon, 1877.
Brown's Creek, Iowa. California salmon, 1875.
Brown's Creek, Washington County, Minn. California salmon, 1876.
Brownville, Tenn., Big Hatchee River. Shad, 1876.
Brown's Lake, Racine County, Wis. California salmon, 1877, 1879.
Brown's Mill Pond, Winona County, Minn. California salmon, 1878.
Brownville, Me., Pleasant River. Penobscot salmon, 1874.
Bruce Lake, Calhoun County, Mich. California salmon, 1875.
Bruin Lake, Dexter, Mich. Whitefish, 1876.
Buchanan County, Iowa. (See Independence, Iowa.)
Buchanan County, Mo., Contrary Lake. California salmon, 1880.
Buchanan County, Mo., Platte River. California salmon, 1880.
Buchanan County, Mo., One Hundred and Two River. California salmon, 1880.
Buchanan County, Mo., Missouri River. California salmon, 1880.
Buchanan County, Mo. (See Saint Joseph, Mo.)

Buckeystown, Md., pond. California salmon, 1880; California trout, 1880; Schoodic salmon, 1880.
Buckingahela River, Bellefontaine, Ohio. Shad, 1874.
Bucks County, Pa. (See Point Pleasant, Pa.)
Buck's Creek, Van Buren County, Mich. California salmon, 1879.
Bucksport, Me., Craig's Pond. California salmon, 1874, 1875.
Bucksport, Me., Hatching-house Pond. California salmon, 1874.
Bucyrus, Ohio, Sandusky River. California salmon, 1874.
Buel Lake, Great Barrington, Mass. Schoodic salmon, 1879, 1880.
Buffalo Creek, Bethany, W. Va. California salmon, 1878, 1879, 1880.
Buffalo Creek, branch of, Marion County, W. Va. Schoodic salmon, 1878.
Buffalo Creek, Lewisburgh, Pa. California salmon, 1879.
Buffalo Creek, Lexington, Va. Schoodic salmon, 1879.
Buffalo Creek, Marion County, W. Va. Schoodic salmon, 1878.
Buffalo Creek, Pa. California salmon, 1875.
Buffalo Creek, Alone, Va. California salmon, 1880.
Buffalo Creek, Rockbridge County, Va. Schoodic salmon, 1877.
Buffalo Creek, Buffalo Mills, Va. California salmon, 1878.
Buffalo Mills, Va., Buffalo Creek. California salmon, 1878.
Buffalo River, Hawley, Minn. California salmon, 1877.
Buffalo River. (See tributary: Lake.)
Bullitt County, Ky. (See Shepherdsville, Ky.)
Bullitt County, Ky., Knob Creek. California salmon, 1877.
Bullock County, Ala. (See Union Springs, Ala.)
Bull Run Creek, Jamestown, N. C. California salmon, 1878.
Bumgartner's Creek, Hart County, Ky. California salmon, 1876.
Buncombe County, N. C , ponds. California trout, 1880.
Buncombe County, N. C., Swannanoa River. California salmon, 1877; California trout, 1880.
Buncombe County, N. C. (See Asheville, N. C.)
Burke County, N. C., John's River. California trout, 1880.
Burke County, N. C., Upper Creek, California trout, 1880.
Burke County, N. C. (See Bridgewater, N. C.; Morganton, N. C.)
Burke's Creek, Cass County, Mich. California salmon, 1875.
Burlingame, Kans., Dragoon. California salmon, 1870.
Burlingame, Kans., Lyndon Lake. California salmon, 1880.
Burlington County, N. J., Mullica River. California salmon, 1879.
Burlington, Vt., Winooski River. Shad, 1874.
Burnsides, Harford County, Md., Green Spring Run. Schoodic salmon, 1879.
Burnt Bridge, Va., North River. California salmon, 1880.
Burrellville, R. I., Wallum Pond. Schoodic salmon, 1876, 1878.
Burritt, Ill., Knapp's Creek. California salmon, 1877.
Burton, W. Va.. Fish Creek. California salmon, 1879, 1880.
Burt's Lake, Cheboygan, Mich. Whitefish, 1876.

Bush Creek, Monrovia, Md. California salmon, 1874.
Bush Creek, New Market, Md. California trout, 1880.
Bushkill Creek, Bushkill, Pa. California salmon, 1876.
Bushkill Creek, Easton, Pa. California salmon, 1874, 1878.
Bushkill Creek, Northampton County, Pa. Penobscot salmon, 1874.
Bushkill, Pa., Bushkill Creek. California salmon, 1876; Penobscot salmon, 1872.
Bushkill, Pa., Delaware River. California salmon, 1875, 1877.
Bushkill River, Easton, Pa. California salmon, 1879.
Bush River, Perryman, Md. Shad, 1878, 1880.
Bush River. (See tributaries: Plum Tree Run and Stony Branch.)
Bush River. (See tributary: Winters Run.)
Bush Run, Fairview, Md. Schoodic salmon, 1880; California trout, 1880.
Butler County, Kans. (See El Dorado, Kans.)
Butler County, Mo. (See Poplar Bluff, Mo.)
Butter Creek, New Milford, Conn. California salmon, 1874; Penobscot salmon, 1875.
Butternut Creek, Hillsdale County, Mich. California salmon, 1873.
Butt's Lake, Washington County, Minn. California salmon, 1876.
Cache County, Utah, Blacksmith's Fork. California salmon, 1876.
Caddo River, Arkadelphia, Ark. Shad, 1878.
Calais, Me., Keene's Lake. Schoodic salmon, 1878, 1879.
Calais, Me., Nash's Lake. Schoodic salmon, 1879.
Caldwell County, Ky., Eddy Creek. California salmon, 1877, 1878.
Caldwell County, N. C. (See Patterson's, N. C.)
Caldwell County, Tex. (See Luling, Tex.)
Caldwell, Greenbrier County, W. V., Greenbrier River. California salmon, 1878.
Caledonia County, Vt. (See Barnet, Vt.; Danville, Vt.; McIndoe's Falls, Vt.; Saint Johnsbury, Vt.; Waterford, Vt.; Wheelock, Vt.)
Caledonia, N. Y., Caledonia Spring Creek. California salmon, 1874, 1875, 1878; Schoodic salmon, 1878.
Caledonia, N. Y., Genesee River. California salmon, 1874, 1875.
Caledonia Spring Creek, Caledonia, N. Y. California salmon, 1874, 1875, 1878.
Caledonia Springs, N. Y. California salmon, 1873.
Calhoun County, Ala. (See Oxford, Ala.)
Calhoun County, Iowa, (See Pomeroy, Iowa.)
Calhoun County, Mich., Bruce Lake. California salmon, 1875.
Calhoun County, Mich., Goguac Lake. California salmon, 1875, 1876, 1878, 1879; Schoodic salmon, 1876.
Calhoun County, Mich., Hamblin Lake. Schoodic salmon, 1876.
Calhoun County, Mich., lake near Marshall. Penobscot salmon, 1873.
Calhoun County, Mich., Lyon and Goguac Lakes. California salmon, 1879.

Calhoun County, Mich., Metcalf Lake. California salmon, 1874, 1875; Schoodic salmon, 1878.
Calhoun County, Mich., Reese Pond. Schoodic salmon, 1876.
Calhoun County, Mich., Town Line. California salmon, 1878.
Calhoun County, Mich. (See Marshall, Mich.)
Calhoun Lake, Hennepin County, Minn. California salmon, 1876.
Callao, Mo., Chariton River. Shad, 1876.
Calumet County, Wis. (See New Holstein, Wis.)
Calumet River, Kensington, Ill. California salmon, 1874; Penobscot salmon, 1874.
Calumet River, Wildwood, Ill. Penobscot salmon, 1874.
Calumet River, South Lawn, Ill. Penobscot salmon, 1874.
Calumet River, South Chicago, Ill. Shad, 1873.
Cambridge, Md., Black Water, River. California salmon, 1879; shad, 1879.
Camden County, N. J. (See Camden, N. J.; Winslow, N. J.)
Camden, N. J., Mullica River. California salmon, 1877.
Camden County, N. C., North River. Shad, 1879.
Cameron County, Pa., Driftwood Branch. California salmon, 1879, 1880.
Cameron County, Minn., Rice County, Minn. California salmon, 1878.
Campbell County, Va. (See Lynchburgh, Va.)
Camp Creek, Fillmore County, Minn. California salmon, 1878.
Campton, N. H., tributary of Merrimac River. Penobscot salmon.
Campton and Plymouth, N. H., Pemigewasset River. California salmon, 1876, 1878, 1879.
Canaan Mountain Pond, Falls Village, Conn. Schoodic salmon, 1880.
Canaan, N. H., Hart's Pond. Schoodic salmon, 1880.
Canes Run, Scott County, Ky. California salmon, 1876.
Canosia Lake, Duluth, Minn. Schoodic salmon, 1879.
Cannon River, Faribault, Minn. California salmon, 1877.
Cannon River, Owatonna, Minn. California salmon, 1877.
Cannon River, Rice County, Minn. California salmon, 1875; Schoodic salmon, 1879.
Cannon River. (See tributaries: Shields, Cedar Lake, Roberd's Lake, Bell Creek, Washington Lake, Jefferson Lake.)
Canterbury, Conn., Quinnebaug River. Shad, 1875.
Canton, Miss., Big Black River. Shad, 1877.
Cape Fear River, Lockville, N. C. Shad, 1878.
Cape Fear River, Greenesborough, Guilford County, N. C., ponds. Schoodic salmon, 1878.
Cape Fear River. (See tributaries: Deep River, Bull Run Creek, N. Fork Deep River, Haw River, Goshen Creek, Six Runs.)
Cape May County, N. J. (See Dennisville, N. J.; Tuckahoe, N. J.)
Capo Creek, Pierce City, Mo. California salmon, 1878.
Carleton County, Minn., Bear Lake. California salmon, 1878.
Carleton County, Minn., Chubb Lake. California salmon, 1878.

Carleton County, Minn., Cub Lake. California salmon, 1878.
Carleton County, Minn., Hanging Horn Lake. California salmon, 1878.
Carleton County, Minn., Moose Horn Lake. California salmon, 1878.
Carleton County, Minn., Moose Lake. California salmon, 1877, 1878.
Carnelian Lake, Stearns County, Minn. California salmon, 1878.
Caroline County, Md. (See Carter's Bridge, Md.; Denton, Md.; Federalsburgh, Md.; Greensborough, Md.; Henderson, Md.; Hillsborough, Md.)
Caroline County, Va. (See Milford, Va.)
Carpenter's Point, Md., North East River. Shad, 1876.
Carp River, Negaunee, Mich. California salmon, 1874.
Carroll County, Md. (See Carrollton, Md.; Double Pipe Creek, Md.; Hood's Mills, Md.; Middleburgh, Md.; Mount Airy, Md.; New Windsor, Md.; Sykesville, Md.; Tank Station, Md.; Titusburg, Md.; Union Bridge, Md.; Wakefield, Md.; Westminster, Md.; York Road, Md.)
Carroll County, N. H. (See Brookfield, N. H.; Conway, N. H.; Madison, N. H.; Ossipee, N. H.; Sandwich, N. H.; Wakefield, N. H.; Wolfborough, N. H.)
Carroll County, Tenn. (See Huntingdon, Tenn.)
Carroll Creek, Mount Carroll, Ill. California salmon, 1878, 1879.
Carrollton, Md., pond. California trout, 1880; Schoodic salmon, 1880.
Carson City, Nev., Mexican Dam. California salmon, 1879.
Carson River. (See tributary: Mexican Dam.)
Carter's Bridge, Caroline County, Md., Great Choptank River. California salmon, 1879.
Carter County, Ky., Little Sandy River. California salmon, 1878.
Carter County, Ky., Tygert River. California salmon, 1878.
Carter Lake, Barry County, Mich. California salmon, 1875.
Cartersville, Ga., Coosa River. California salmon, 1876.
Cartersville, Ga., Etowah River. Shad, 1878; California salmon, 1878.
Carthage, Mo., Spring River. California salmon, 1878, 1879.
Carver County, Minn., Clear Lake. California salmon, 1876.
Carver County, Minn., Minnewasta Lake. California salmon, 1878.
Carver County, Minn., Waconica Lake. California salmon, 1878.
Carver County, Minn., lake. California salmon, 1876.
Cary Station, Ill., Fox River. California salmon, 1879.
Cascade Branch of Patapsco River, Elk Ridge Landing, Md. Schoodic salmon, 1878.
Casey County, Ky., Green River. California salmon, 1876.
Cass County, Ind. (See Logansport, Ind.)
Cass County, Iowa. (See Atlantic, Iowa.)
Cass County, Mich., Barrow Lake, Salmon Lake. California salmon, 1875, 1879.
Cass County, Mich., Burke's Creek. California salmon, 1875.
Cass County, Mich., Diamond Lake. California salmon, 1878.

Cass County, Mich., Dowagiac River. California salmon, 1875, 1875, 1875.
Cass County, Mich., Indian Creek. California salmon, 1875.
Cass County, Mich., Indian Lake. California salmon, 1878.
Cass County, Mich., Millen Creek. California salmon, 1878.
Cass County, Mich., Muncy Lake. California salmon, 1876.
Cass County, Mich., Peavine Creek. California salmon, 1875, 1879.
Cass County, Mich., Pine Creek. California salmon, 1879.
Cass County, Mich., Pokagon Creek. California salmon, 1878, 1879.
Cass County, Minn., Sandy Lake. Schoodic salmon, 1879.
Cass County, Mich., Williams' Creek. California salmon, 1875.
Cass County, Mich. (See Howard, Mich.; Pokagon, Mich.)
Cass River, Saginaw County, Mich. California salmon, 1879.
Castalia, Ohio, Castalia Spring. California salmon, 1873.
Castalia, Ohio, Castalia Spring Stream. Penobscot salmon, 1873.
Castalia, Ohio, Cold Creek. California salmon, 1877, 1879.
Castalia Spring, Castalia, Ohio. California salmon, 1873.
Castalia Spring Stream, Castalia, Ohio. Penobscot salmon, 1873.
Castleton, Vt., pond. Schoodic salmon, 1876.
Catawba County, N. C. (See Catawba, N. C.; Newton, N. C.)
Catawba, N. C., Catawba River. Shad, 1876, 1877, 1878.
Catawba River, Catawba, N. C. Shad, 1876, 1877, 1878.
Catawba River, Charlotte, N. C. California salmon, 1872.
Catawba River, Charlotte, N. C. California salmon, 1879. (See S. C.)
Catawba River, Morganton, N. C. California salmon, 1880.
Catawba River, Old Fort, N. C. California salmon, 1878, 1879.
Catawba River, tributaries of, Charlotte, Mecklenburgh County, N. C., ponds. Schoodic salmon, 1878.
Catawba River, tributaries of, Morganton, N. C., ponds. Schoodic salmon, 1878.
Catawba River, Rock Hill, S. C. Shad, 1880.
Catawba River. (See tributaries: Linville River, John's River, Upper Creek, Clark's Creek, Mill Creek.)
Catfish River. (See tributary: Mendota Lake.)
Cathance Lake, Cooper, Me. Schoodic salmon, 1878.
Catonsville, Md., Gwynn's Falls. California trout, 1880; Schoodic salmon, 1880.
Cattaraugus County, N. Y. (See Salamanca, N. Y.)
Cave Spring Branch, Green County, Ky. California salmon, 1877.
Cayuga County, Spring Brooks. California salmon, 1879.
Cayuga Lake, N. Y. California salmon, 1874.
Cayuga Lake, N. Y. (See tributary: Spring Creeks.)
Cecil County, Md., Bohemia River. California salmon, 1879, 1880.
Cecil County, Md., Northeast River. Shad, 1878.
Cecil County, Md., Sassafras River. California salmon, 1880.

Cecil County, Md. (See Bohemia Bridge, Md.; Carpenter's Point, Md.; De Graw's, Md.; Elkton, Md.; Harris Dam, Md.; Liberty Grove, Md.; Northeast, Md.; Port Deposit, Md.; Rock Church, Md.; Rowlandville, Md.; Saint Marks, Md.; Sandy Branch, Md.; Scintman's Mill, Md.)
Cedar County, Iowa. (See Tipton, Iowa.)
Cedar Creek, Richfield, Wis. California salmon, 1879.
Cedar Creek, Strasburgh, Va. California salmon, 1876.
Cedar Creek, Winchester, Va. California salmon, 1874.
Cedar Lake, Martin County, Minn. Schoodic salmon, 1879.
Cedar Lake, Northfield, Minn. California salmon, 1877.
Cedar Lake, Rice County, Minn. California salmon, 1875, 1876, 1877, 1878; Schoodic salmon, 1879; Penobscot salmon, 1875.
Cedar Lake, Wantonwan County, Minn. California salmon, 1879.
Cedar Point, Md., Patuxent River. California salmon, 1876, 1876.
Cedar Rapids, Iowa, Cedar River. California salmon, 1874; Penobscot salmon, 1875; shad, 1878.
Cedar Rapids, Iowa, Des Moines River. Shad, 1878.
Cedar Rapids, Linn County, Iowa, Cedar River. Schoodic salmon, 1878.
Cedar River, Cedar Rapids, Iowa. California salmon, 1874; Penobscot salmon, 1875; Schoodic salmon, 1878; shad, 1878.
Cedar River, Freeborn County, Minn. California salmon, 1875.
Cedar River, Iowa. California salmon, 1878, 1879, 1879.
Cedar River, Marion, Iowa. California salmon, 1874.
Cedar River, Mower County, Minn. California salmon, 1875.
Cedar River, Springville, Iowa. California salmon, 1875.
Cedar River, Tipton, Iowa. California salmon, 1874, 1875.
Cedar River, Waterloo, Iowa. California salmon, 1874.
Cedar River, Wilton, Iowa. California salmon, 1875.
Cedar Rock Lake, Wis. Penobscot salmon, 1875.
Central Kentucky Lunatic Asylum Pond. California salmon, 1877.
Centralia, Kans., Red Vermillion River. California salmon, 1878, 1879.
Central, Va., New River. California salmon, 1874; Schoodic salmon, 1875, 1880; shad, 1873.
Centre County, Pa. (See Bellefonte, Pa.)
Centre Harbor, N. H., Winnipiseogee Lake. Schoodic salmon, 1879.
Centreville, Md., Corsica River. Shad, 1879.
Cerro Gordo County, Iowa. (See Clear Lake, Iowa.)
Chabot Lake, Alameda County, Cal. Schoodic salmon, 1878; whitefish, 1879.
Chain Lake, Martin County, Minn. California salmon, 1879.
Chambersburgh, Pa., Conecocheague River. California salmon, 1873.
Chamock Brook, Dodge County, Minn. California salmon, 1878.
Champlain Lake. (See tributaries: Kelly Brook, Missisquoi River.)
Champlain Lake. (See tributaries: Lewis Creek, Otter Creek, Winooski Creek, Missisquoi River, Lamville River.
Chapinville, Conn., Twin Lakes. Schoodic salmon, 1876, 1879.

Chapman, Kans., Chapman's Creek. California salmon, 1878, 1879, 1881.
Chapman's Creek, Chapman, Kans. California salmon, 1878, 1879, 1881.
Chariton River, Callao, Mo. Shad, 1876.
Chariton River, Macon County, Mo. California salmon, 1880; shad, 1880.
Charles County, Md. (See Glymont, Md.)
Charles River, Baltimore, Md. Schoodic salmon, 1879.
Charleston County, S. C. (See Charleston, S. C.)
Charleston County, S. C., Cooper River. California salmon, 1879; shad, 1879.
Charleston, Ill., Embarrass River. Shad, 1878.
Charleston, Kanawha County, W. Va., Kanawha River. California salmon, 1878.
Charleston, S. C., Cooper River. California salmon, 1877.
Charleston, W.Va., Elk River. California salmon, 1879, 1880.
Charlestown, N. H., Connecticut River. Penobscot salmon, 1874.
Charlevoix County, Mich., Bear Creek. California salmon, 1876, 1876.
Charlevoix County, Mich., Boyne River. California trout, 1880.
Charlevoix County, Mich., Wallow Lake. California salmon, 1878.
Charlevoix County, Mich. (See Boyne Falls, Mich.)
Charlotte, Iowa, Maquoketa River. California salmon, 1874.
Charlotte Lake, Wright County, Minn. California salmon, 1877.
Charlotte, Me., Crocker's Lake. Schoodic salmon, 1878.
Charlotte, Me., Moosehorn Waters. Schoodic salmon, 1878.
Charlotte, Me., Sprague's Pond. Schoodic salmon, 1878.
Charlotte, Mecklenburgh County, N. C., ponds tributaries to Catawba River. Schoodic salmon, 1878.
Charlotte, N. C., Catawba River. California salmon, 1872, 1879.
Chase County, Kans. (See Cottonwood Falls, Kans.)
Chastatee River, Balding's Mill, Ga. California salmon, 1878.
Chatham County, N. C. (See Lockville, N. C.)
Chattahoochee River, Atlanta, Ga. Shad, 1876.
Chattahoochee River, Boltonville, Ga. Shad, 1880.
Chattahoochee River, Columbus, Ga. Shad, 1877, 1879.
Chattahoochee River, Gainesville, Ga. California salmon, 1878; shad, 1879.
Chattahoochee River, Norcross, Ga. California salmon, 1877.
Chattahoochee River, West Point, Ga. Shad, 1877.
Chattanooga, Tenn., Tennessee River. Shad, 1876, 1879.
Chautauqua County, N. Y., Chautauqua Lake. California salmon, 1875.
Chautauqua Lake, Chautauqua County, N. Y. California salmon, 1875.
Chazy River, Ellenburgh, N. Y. Penobscot salmon, 1875.
Cheat River, Rowlesburgh, W. Va. Shad, 1879.
Chebacco Lake, Essex, Mass. Schoodic salmon, 1877, 1879.

Cheboygan County, Mich. (See Cheboygan, Mich.)
Cheboygan, Mich., Buit's Lake. Whitefish, 1876.
Chelsea, Mich., Lowe Lake. Whitefish, 1876.
Chelsea, Mich., Round Lake. Whitefish, 1876.
Chenango County, N. Y., Round Lake. California salmon, 1874.
Cherokee County, Iowa. (See Cherokee, Iowa.)
Cherokee, Iowa, Little Sioux River. California salmon, 1875.
Cherry Run Depot, W. Va., Potomac River. California salmon, 1874.
Cheshire County, N. H., sundry ponds. Schoodic salmon, 1879.
Cheshire County, N. H. (See Chesterfield, N. H.; Jaffrey, N. H.; Nelson, N. H.; Rindge, N. H.)
Chester County, Pa. (See Glenlock, Pa.; Spring City, Pa.; Toughkenamon, Pa.; Uwchland, Pa.; West Grove, Pa.)
Chesterfield, N. H., Spofford Lake. Schoodic salmon, 1880.
Chester River, Millington, Md. California salmon, 1876, 1878, 1879, 1880; shad, 1878, 1879.
Chester River. (See tributaries: Andover Branch, Corsica River.)
Chestnut Pond, Epsom, N. H. Schoodic salmon, 1880.
Chestnut Pond, Northfield, N. H. Schoodic salmon, 1879.
Chewsville, Md., Antietam Creek. California salmon, 1876.
Chickacomico River, Dorchester County, Md. California salmon, 1879.
Chickacomico River, Fleming's Mill, Md. California salmon, 1879.
Chickasaw County, Iowa. (See Fredericksburgh, Iowa.)
Chickasawha River. (See tributaries: Okatibee Creek, Chunky River.)
Chickasawha River, Meridian, Miss. California salmon, 1876.
Chickies, Pa., Chiquesalunga Creek. California salmon, 1876.
Chillisquaque, Pa., North Branch Susquehanna River. California salmon, 1877.
Chippewa County, Wis., Three-Mile Lake. California salmon, 1877.
Chippewa River, Benson, Minn. California salmon, 1877.
Chippewa River, Midland, Mich. California salmon, 1875.
Chippewa River, Pope County, Minn. California salmon, 1878.
Chippewa River. (See tributary: Hassel Lake.)
Chippewa River. (See tributary: White Bear Lake.)
Chippewa River. (See tributary: Three-Mile Lake.)
Chiquesalunga Creek, Chickies, Pa. California salmon, 1876.
Chiquesalunga Creek, Lancaster County, Pa. California salmon, 1875, 1877; Penobscot salmon, 1874.
Chisago County, Minn., Chisago Lake. California salmon, 1876, 1877.
Chisago County, Minn., Danewood Lake. California salmon, 1877.
Chisago County, Minn., Forest Lake. California salmon, 1877.
Chisago County, Minn., Green Lake. California salmon, 1877.
Chisago County, Minn., North Branch of Goose Creek. California salmon, 1877.
Chisago County, Minn., Rush Lake. California salmon, 1877.
Chisago County, Minn., Saint Croix River. California salmon, 1875.

Chisago County, Minn., Taylor's Falls. California salmon, 1875.
Chisago County, Minn. (See Stacy, Minn.)
Chisago Lake, Chisago County, Minn. California salmon, 1876, 1877.
Chittenden County, Vt. (See Burlington, Vt.; Essex, Vt.)
Choctawhatchee River. (See tributary: Pea River.)
Choptank River, Denton, Md. Shad, 1877.
Choptank River, Greensborough, Md. California salmon, 1876; shad, 1878.
Choptank River, Henderson, Md. California salmon, 1878, 1879, 1880; shad, 1879.
Choptank River. (See tributaries: Tread Haven, Tuckahoe River, Tuckahoe Creek, Trappe River.)
Chowan River, Avoca, N. C. Shad, 1878.
Chowan River, Coleraine, N. C. Shad, 1878.
Chowan River. (See tributaries: Salmon Creek, Meherrin River, Nottoway River.)
Chowan River. (See tributaries: Nottoway River, Blackwater River.)
Christiana Creek, Wilmington, Del. Shad, 1880.
Christian County, Ky., Little River. California salmon, 1878.
Christmass Lake, Minn. California salmon, 1877, 1880.
Chubb Lake, Carleton County, Minn. California salmon, 1878.
Chuck Creek, Tenn., French Broad River. California salmon, 1876.
Chunky River, Meridian, Miss. Shad, 1879.
Church Lake, Kent County, Mich. California salmon, 1876.
Circle Lake, Rice County, Minn. California salmon, 1878.
Clackamas River, Cal. California salmon, 1877, 1878.
Clam Lake, Clam Lake, Mich. California salmon, 1876.
Clam Lake, Mich., Clam Lake. California salmon, 1876.
Clare County, Mich., Crooked Lake. Schoodic salmon, 1878.
Clare County, Mich., Roney Lake. Schoodic salmon, 1878.
Clare County, Mich. (See Surrey, Mich.)
Clark County, Ark., Ouachita River. Shad, 1879.
Clark County, Ark. (See Arkadelphia, Ark.)
Clark County, Ky., Howard's Lower Creek. California salmon, 1876.
Clark County, Ky., Howard's Upper Creek. California salmon, 1876.
Clark County, Ky., Stoner Creek. California salmon, 1876.
Clark County, Ky., Strode's Creek. California salmon, 1876.
Clark County, Ky., Lulbregrud Creek. California salmon, 1876.
Clarksburgh, W. Va., West Fork of the Monongahela River. California salmon, 1876; Schoodic salmon, 1879.
Clarksburgh, W. Va., West Fork River. Shad, 1879.
Clark's Creek, Newton, N. C. California salmon, 1879.
Clay Centre, Kans., Republican River. California salmon, 1880.
Clay County, Kans. (See Clay Centre, Kans.)
Clay County, Minn. (See Hawley, Minn.; Moorhead, Minn.)
Clayton County, Ga. (See Jonesborough, Ga.)

Clayton County, Iowa. (See McGregor, Iowa.)
Clayton, Del., Duck Creek. Shad, 1879.
Clear Creek, Barrett, Kans. California salmon, 1878, 1879.
Clear Creek County, Colo. (See Georgetown, Colo.)
Clear Creek, Farisville, Kans. Schoodic salmon, 1880.
Clear Creek, Hempstead, Tex. California salmon, 1874, 1876.
Clear Creek, Shelby County, Ky. California salmon, 1876.
Clear Lake, Blue Earth County, Minn. California salmon, 1877.
Clear Lake, Brown County, Minn. California salmon, 1878.
Clear Lake, Cal. Whitefish, 1872, 1873.
Clear Lake, Carver County, Minn. California salmon, 1876.
Clear Lake, Cerro Gordo County, Iowa, Clear Lake. Schoodic salmon, 1878.
Clear Lake, Georgetown, Colo. California salmon, 1874.
Clear Lake, Iowa. Whitefish, 1876; Penobscot salmon, 1876.
Clear Lake, Minn. California salmon, 1877.
Clear Lake, Railroad Crossing, La. Shad, 1879.
Clear Lake, Sherburne County, Minn. California salmon, 1877.
Clear Lake, Waseca County, Minn. California salmon, 1876.
Clear Lake, Washington County, Minn. California salmon, 1878.
Clear Lake, Wis. Schoodic salmon, 1879.
Clear Lake, Wis., Willow River. California salmon, 1879.
Clear Spring, Md., Frantz Mill Dam. California trout, 1880.
Clear Spring, Md., Mill Dam. Schoodic salmon, 1880.
Clear Water Creek, Wright County, Minn. California salmon, 1878.
Clear Water Lake, Minn. California salmon, 1877.
Clermont, Iowa, Turkey River. California salmon, 1875.
Clifton Forge, Va., Jackson River. Schoodic salmon, 1879.
Clifton, Kans., Republican River. California salmon, 1880.
Clinch County, Ga. (See Stockton, Ga.)
Cline's Pond, New Jersey. California salmon, 1879.
Clinton County, Ill. (See Trenton, Ill.)
Clinton County, Iowa. (See Charlotte, Iowa; Clinton Junction, Iowa; De Witt, Iowa.)
Clinton County, Mich., Round Lake. California salmon, 1875.
Clinton County, Mo., Smith Fork of Platte River. California salmon, 1880.
Clinton County, N. Y. (See Ellenburgh, N. Y.; Peru, N. Y.; West Plattsburgh, N. Y.)
Clinton County, Pa. (See Westport, Pa.)
Clinton Junction, Iowa, tributary of Mississippi River. California salmon, 1874.
Clinton River, Pontiac, Mich. California salmon, 1876.
Clinton River, Utica, Mich. California salmon, 1875.
Cloud County, Kans. (See Concordia, Kans.)
Coahoma County, Miss. (See Friar's Point, Miss.)

Cobb's Branch, Westminster, Md. Schoodic salmon, 1879.
Coboseeontee Lake, Manchester, Me. Schoodic salmon, 1879.
Cockeysville, Md., Gunpowder River. California salmon, 1878, 1879; Schoodic salmon, 1878; shad, 1877, 1878, 1879.
Cockeysville, Md., Western River. California salmon, 1876.
Cocnochogue River, Durham, Conn. California salmon, 1874.
Codorus Creek, Pa. Penobscot salmon, 1874.
Cohansey Creek, Bridgeton, N. J. California salmon, 1877.
Cohansey Creek, N. J. California salmon, 1877.
Cohocton River, Liberty, N. Y. California salmon, 1873.
Cold Creek, Castalia, Ohio. California salmon, 1877, 1879.
Cold Pond, Acworth, N. H. Schoodic salmon, 1880.
Cold Spring Pond. Enfield, Me. Schoodic salmon, 1878.
Cold Spring, W. Va, Wheeling Creek. California salmon, 1878; Schoodic salmon, 1879.
Cold Water Creek, Oxford, Ala. California salmon, 1878.
Coldwater Lake, Branch County, Mich. California salmon, 1875.
Cold Water River, Holly Springs, Miss. Shad, 1878.
Colebrook, Conn., Farmington River. California salmon, 1873, 1873.
Colerain, N. C., Chowan River. Shad, 1878.
Coles County, Ill. (See Charleston, Ill.)
Collier's Creek, Collierstown, Va. California salmon, 1880.
Collierstown, Va., Collier's Creek. California salmon, 1880.
Colon, Mich., Sturgeon Lake. California salmon, 1876.
Colorado County, Tex. (See Columbus, Tex.)
Colorado River, Austin, Tex. Shad, 1874, 1875, 1879; California salmon, 1874, 1876.
Colorado River, Columbus, Tex. Shad, 1879.
Colt's Reservoir, Hartford, Conn. Schoodic salmon, 1880.
Columbia, Ala., Tombigbee River. Shad, 1879.
Columbia County, Wis. (See Hartman, Wis.; Lodi, Wis.; Portage, Wis.; Poynette, Wis.)
Columbiana County, Ohio. (See Bayard, Ohio.)
Columbia, Pa., tributary of Susquehanna River. California salmon, 1876.
Columbia, S. C., Broad River. Shad, 1878, 1880, 1880; California salmon, 1879.
Columbus, Ga., Chattahoochee River. Shad, 1877, 1879.
Columbus, Ind., White River. Shad, 1874.
Columbus, Ohio. Scioto River. Shad, 1875, 1876.
Columbus, Ohio. Whetstone River. California salmon, 1878.
Columbus, Tex., Colorado River. Shad, 1879.
Column Lake, McHenry, Ill. California salmon, 1877.
Como Lake, Houston County, Minn. California salmon, 1878; Schoodic salmon, 1879.
Como Lake, Ramsey County, Minn. Schoodic salmon, 1875; Penobscot salmon, 1875; California salmon, 1875, 1876, 1877.

Concordia, Kans., Republican River. California salmon, 1878, 1879, 1880.
Concord, Vt., Connecticut River. Penobscot salmon, 1874.
Conecuh River, Union Springs, Ala. Shad, 1879.
Coneloquinet Creek, Pa. California salmon, 1874.
Coneloquinet Creek, Cumberland County, Pa. California salmon, 1876.
Conesus Lake, Livingston County, N. Y. California salmon, 1875.
Conetquoit River, Long Island, N. Y. California salmon, 1876, 1877.
Congamond Lake, Westfield, Mass. Schoodic salmon, 1876, 1879, 1880.
Conneaut Creek, Erie County, Pa. Schoodic salmon, 1880.
Connecticut Lake, Pittsburgh, N. H. Schoodic salmon, 1879.
Connecticut River, Bellows Falls, Vt. Shad, 1874, 1874, 1874, 1876.
Connecticut River, Charlestown, N. H. Penobscot salmon, 1874.
Connecticut River, headwaters of, N. H. Penobscot salmon, 1874.
Connecticut River, ponds tributary to, Saint Johnsbury, Vt. Schoodic salmon, 1878.
Connecticut River, Smith's Ferry, Mass. Shad, 1874, 1875, 1877.
Connecticut River, South Hadley Falls, Mass. Shad, 1875, 1876, 1877.
Connecticut River, South Vernon, Vt. Shad, 1875, 1875.
Connecticut River, tributaries of, Thompsonville, Conn. Schoodic salmon, 1878.
Connecticut River, Barnet, Vt. Penobscot salmon, 1874.
Connecticut River, Concord, Vt. Penobscot salmon, 1874.
Connecticut River, tributaries of, Conn. Penobscot salmon, 1873.
Connecticut River, McIndoe's Falls, Vt. Penobscot salmon, 1874.
Connecticut River, Newbury, Vt. Penobscot salmon, 1874.
Connecticut River. (See tributaries: Farmington River, West River, Conochogue River, Westfield River, Passumpsic River, Wells River, West River, Saxton's River, White River, Lamoille River, Dog River.)
Conococheague River, Chambersburgh, Pa. California salmon, 1873.
Conococheague River, Hagerstown, Md. California salmon, 1874, 1876, 1879.
Conococheague River, Md. Penobscot salmon, 1880.
Conococheague River, Williamsport, Md. California salmon, 1876.
Contentnea Creek, Wilson County, N. C. Shad, 1877.
Contoocook River, Contoocook, N. H. Shad, 1877.
Contoocook River, Hillsborough Bridge, N. H. California salmon, 1878, 1879.
Contoocook River, N. H. Penobscot salmon, 1875.
Contoocook, N. H., Contoocook River. Shad, 1877.
Contrary Lake, Buchanan County, Mo. California salmon, 1880.
Conway, N. H., Walker's Pond. Schoodic salmon, 1880.
Conyers, Ga., Yellow River. Shad, 1879.
Cook County, Ill. (See Arlington Heights, Ill.; Kensington, Ill.; South Chicago, Ill.; South Lawn, Ill.; Wildwood, Ill.)
Cook's Lake, Linden, Mich. Whitefish, 1876.

Cook's Pond, Brookfield, N. H. California salmon, 1879.
Coon Lake, Minn. California salmon, 1877.
Coon River. (See Raccoon.)
Cooper, Me., Cathance Lake. Schoodic salmon, 1878.
Cooper River, Charleston County, S. C. California salmon, 1879; shad, 1879.
Cooper River, Charleston, S. C. California salmon, 1877.
Coosa River, Cartersville, Ga. California salmon, 1876.
Coosa River, Resaca, Ga. California salmon, 1878; shad, 1879.
Coosa River, Rome, Ga. Shad, 1875.
Coosa River. (See tributaries: Tombigbee River, Cold Water Creek, and Etowah River.)
Coos County, N. H. (See Pittsburgh, N. H.; Stark, N. H.; Stewartstown, N. H.)
Cooper Creek, Iowa. California salmon, 1878.
Cordova Station, Md., Miles Creek. Shad, 1879.
Cordova Station, Md., Wye Mills Creek. Shad, 1879.
Cornelian Lake, Stearns County, Minn. California salmon, 1877.
Cornelian Lake, Washington County, Minn. California salmon, 1876, 1877.
Corry, Pa., Hatching Ponds. Schoodic salmon, 1878; California trout, 1880.
Corsica River, Centreville, Md. Shad, 1879.
Corunna, Mich., Shiawassee River. Shad, 1874.
Coshocton, Ohio, Walhonding River. California salmon, 1877.
Coshocton County, Ohio. (See Coshocton, Ohio.)
Cottonwood County, Minn., Bingham Lake. California salmon, 1876.
Cottonwood County, Minn., Eagle Lake. California salmon, 1877.
Cottonwood County, Minn., Mountain Lake. California salmon, 1877.
Cottonwood County, Minn., String Lake. California salmon, 1876.
Cottonwood County, Minn., Welder Lake. California salmon, 1876.
Cottonwood County, Minn., Windom Lake. California salmon, 1876.
Cottonwood County, Minn. (See Windom, Minn.)
Cottonwood Falls, Kans., Cottonwood River. Shad, 1879.
Cottonwood River, Cottonwood Falls, Kans. Shad, 1879.
Cottonwood River, Florence, Kans. California salmon, 1878, 1879, 1880; shad, 1879.
Cottonwood River. (See tributary: Sleepy Eye Lake.)
Cotuit, Mass., Cotuit River. Penobscot salmon, 1876; Schoodic salmon, 1876.
Cotuit River, Cotuit, Mass. Penobscot salmon, 1876.
Council Bluffs, Iowa, tributary of Missouri River. Penobscot salmon, 1875.
Covington, Ky., Glasser's Lakes. Schoodic salmon, 1878.
Covington, Ga., Ocmulgee River. California salmon, 1878; shad, 1877.
Covington, Ga., Ulcofauhanchee River. Shad, 1879.

Covington, Ga., Yellow River. California salmon, 1878; shad, 1880.
Cow Creek, Hutchinson, Kans. California salmon, 1878, 1679; shad, 1879.
Craig's Creek, Fincastle, Va. Schoodic salmon, 1879.
Craig's Pond, Bucksport, Me. California salmon, 1874, 1875.
Craven County, N. C. (See New Berne, N. C.)
Crawford County, Mich., R. R. Crossing, Au Sable River. California salmon, 1874.
Crawford County, Ohio. (See Bucyrus, Ohio.)
Crawford County, Wis., streams. California salmon, 1874.
Crawford, Mich., Au Sable River. California salmon, 1876.
Crawfordsville, Ga., Ogeechee River. California salmon, 1877.
Credit Lake, Scott County, Minn. California salmon, 1878.
Crib Lake, Carleton County, Minn. California salmon, 1878.
Crisfield, Md., branch of Pocomoke Bay. California salmon, 1876.
Crittenden County, Ky., Hurricane Creek. California salmon, 1877.
Crocker's Lake, Charlotte, Me. Schoodic salmon, 1878.
Crofton, Mich., Bass Lake. Whitefish, 1876.
Crofton, Mich., Loon Lake. Whitefish, 1876.
Crooked Lake, Anoka County, Minn. California salmon, 1877.
Crooked Lake, Petosky, Mich. Whitefish, 1876.
Crooked Lake, Surrey, Clare County, Mich. California salmon, 1878; Schoodic salmon, 1878.
Crookston, Minn., tributary of Red Lake River. California salmon, 1880.
Crouch's Creek, Jackson, Mich. California salmon, 1874.
Crouch's Fishery, Jackson, Mich. California salmon, 1874.
Crow River. (See tributaries: Green Lake, Morrison Lake, Chisago Lake, Koronis Lake.)
Crow Wing County, Minn., Brainerd. Penobscot salmon, 1875.
Crow Wing County, Minn., Withington Lake. Penobscot salmon, 1875.
Crow Wing County, Minn. (See Brainerd, Minn.)
Crystal Iron Springs, Emmittsburgh, Md. Schoodic salmon, 1878.
Crystal Lake, Blue Earth County, Minn. California salmon, 1877, 1880.
Crystal Lake, Crystal Lake, Ill. California salmon, 1879.
Crystal Lake, Dakota County, Minn. California salmon, 1876.
Crystal Lake, Greenwood, Mass. Schoodic salmon, 1877, 1878.
Crystal Lake, Ill., Crystal Lake. California salmon, 1879.
Crystal Lake, Mashpee, Mass. Schoodic salmon, 1879.
Crystal Lake, Newton, Mass. Schoodic salmon, 1877.
Crystal Lake, Oceana County, Mich. California salmon, 1879.
Crystal Springs Creek, Mich. California salmon, 1875.
Cullom's Creek, Mich. California salmon, 1874.
Culpeper County, Va. (See Rapid Ann Station, Va.)
Cumberland County, N. J., Maurice River. California salmon, 1879.
Cumberland County, N. J. (See Bridgeton, N. J., Vineland, N. J.)
Cumberland County, Pa., Conoloquinet Creek. California salmon, 1876.

Cumberland County, Pa. (See Mechanicsburgh, Pa.; Newville, Pa.; Williams Mill, Pa.)
Cumberland, Md., Potomac River. Shad, 1876, 1877, 1880.
Cumberland River, Nashville, Tenn. Shad, 1875, 1875, 1879.
Cumberland River, Pulaski County, Ky.
Cumberland River, Somerset, Ky. Shad, 1878.
Cumberland River. (See tributaries: White Oak Branch, Round Stone Creek, Hardin Durham's Branch, Little River, Eddy Creek.)
Cunningham Pond, Petersborough, N. H. Schoodic salmon, 1880.
Currant River, Doniphan, Mo. California salmon, 1879.
Cuyahoga River, Kent, Ohio. Shad, 1872.
Cuyahoga River. (See tributary: Newberry Pond.)
Dakota County, Minn. California salmon, 1876.
Dakota County, Minn., Crystal Lake. California salmon, 1876.
Dakota County, Minn., Lake Early. California salmon, 1878.
Dakota County, Minn., Farmington River. California salmon, 1875; Penobscot salmon, 1875.
Dakota County, Minn., Farquhar Lake. California salmon, 1878.
Dakota County, Minn., Kennedy Lake. California salmon, 1876, 1878.
Dakota County, Minn., McGrath's Lake. California salmon, 1878.
Dakota County, Minn., S. Branch Vermillion River. California salmon, 1878.
Dakota County, Minn., Spring Lake. Schoodic salmon, 1879.
Dakota County, Minn., Sunfish Lake. California salmon, 1876.
Dakota County, Minn., Twin Lakes. California salmon, 1878, 1880.
Dallas County, Tex. (See Dallas, Tex.)
Dallas, Pa., Harvey's Lake. California salmon, 1880.
Dallas, Tex., Trinity River. Shad, 1879.
Damariscotta, Me., pond. Schoodic salmon, 1879.
Danbury, Conn., Lake Kenosha. Schoodic salmon, 1879.
Danbury, Stokes County, N. C., Dan River. Schoodic salmon, 1878.
Dane County, Wis., Mendota Lake. California salmon, 1877.
Dane County, Wis. (See Madison, Wis.)
Danewood Lake, Chisago County, Minn. California salmon, 1877.
Danforth, Me., Mattawamkeag River. Penobscot salmon, 1874.
Danforth, Me., tributary of Penobscot River. Penobscot salmon, 1875.
Dan River, Danbury, N. C. California salmon, 1879.
Dan River, Danbury, Stokes County, N. C. Schoodic salmon, 1878.
Dan River, Halifax County, Va. Shad, 1877.
Danville, Vt., Joe's Pond. Schoodic salmon, 1878.
Dauphin County, Pa., Swatara Creek. Penobscot salmon, 1874; California salmon, 1877.
Dauphin County, Pa. (See Harrisburg, Pa.; Upper Paxton, Pa.)
Davidson County, Tenn. (See Madison, Tenn.; Nashville, Tenn.)
Davis County, Kans., Republican River. Shad, 1879.
Davis County, Kans. (See Junction City, Kans.)

Davis County, Utah, Jenning's Pond. California salmon, 1876, 1877.
Day Lake, Linden, Mich. Whitefish, 1876.
Dayton, Ohio, Miami River. California salmon, 1879.
Dearborn County, Ind. (See Guilford, Ind.)
Dearborn, Mich., Rouge River. California salmon, 1875.
Decorah, Iowa, Upper Iowa River. California salmon, 1875.
Deep Lake, Sand Lake, Ill. California salmon, 1876.
Deep River, North Fork of, Friendship, N. C. California salmon, 1879.
Deep River, Jamestown, N. C. California salmon, 1878, 1878.
Deer Creek, Md. Penobscot salmon, 1875.
Deer Creek, Parkton, Md. California salmon, 1878, 1879.
Deer Creek, Pennsylvania line, Md. California salmon, 1874, 1876.
Deer Creek (See tributaries: Tobacco Run, Archer's Run, Green Spring.)
Deer Park, Md., Little Youghiogheny River. Shad, 1880.
Deer Park, Md., pond. Schoodic salmon, 1878.
Deer Park, Md., Youghiogheny River. California salmon, 1877.
Defiance County, Ohio. (See Defiance, Ohio.)
Defiance, Ohio, Maumee River. California salmon, 1878.
De Graw's, Md., Octorara River. California salmon, 1879, 1880.
De Kalb County, Ala. (See Lebanon, Ala.)
Delaware County, Iowa. (See Delaware, Iowa; Delhi, Iowa; Greeley, Iowa; Hopkinton, Iowa; Manchester, Iowa.)
Delaware County, Pa. (See Brandywine, Pa.)
Delaware, Iowa, Maquoketa River. California salmon, 1875.
Delaware, Iowa, Spring Creek. California salmon, 1875.
Delaware, Kans., Delaware River. California salmon, 1878, 1879.
Delaware River, Bushkill, Pa. California salmon, 1875, 1877.
Delaware River, Delaware, Kans. California salmon, 1878, 1879.
Delaware River, Point Pleasant, Pa. Shad, 1873, 1874.
Delaware River, Shomaker's Eddy, N. J. California salmon, 1879, 1880; Penobscot salmon, 1879.
Delaware River, tributary of, Brandywine, Pa. California salmon, 1876.
Delaware River, tributary of. California salmon, 1874, 1875; Penobscot salmon, 1874.
Delaware River. (See tributaries: Shoemaker's Eddy, Alloway's Creek, Maurice River, Raccoon River, Pohatcong River, Musconetcong River, Dennis Creek, Mantua, Salem, Old Man's, Cohansey, Woodbury, Timber, and Paulinskill Creeks, Bushkill Creek, Heitzman Springbrook, Schuylkill River, and Bear Lake.)
Delaware River, Valley Falls, Kans. California salmon, 1880.
Delhi, Iowa, Maquoketa River. California salmon, 1875.
Demopolis, Ala., Tombigbee River. Shad, 1878.
Dennis Creek, Dennisville, N. J. California salmon, 1876.
Dennison Lake, Winchendon, Mass. Schoodic salmon, 1876, 1877, 1878, 1879.

Dennisville, N. J., Dennis Creek. California salmon, 1876.
Denny's River, Me. Penobscot salmon, 1876.
Denton, Md., Choptank River. Shad, 1877.
Denton, Md., pond. Schoodic salmon, 1880.
Dent's River, Marion County, W. Va. Schoodic salmon, 1878.
Denver, Colo., Platte River. Shad, 1872.
Des Moines, Iowa, Des Moines River. California salmon, 1874, 1874; shad, 1874, 1875, 1876.
Des Moines River, Boone, Boone County, Iowa. Schoodic salmon, 1878.
Des Moines River, Cedar Rapids, Iowa. Shad, 1878.
Des Moines River, Des Moines, Iowa. California salmon, 1874, 1875; shad, 1874, 1875, 1876.
Des Moines River, Fort Dodge, Iowa. California salmon, 1874.
Des Moines River, Iowa. California salmon, 1875, 1876, 1878, 1879, 1879.
Des Moines River, Moingona, Iowa. Shad, 1878.
Des Moines River, Ottumwa, Iowa. California salmon, 1875; shad, 1874.
Des Moines River, Pomeroy, Iowa. California salmon, 1875.
Des Moines River, Storm Lake, Iowa. California salmon, 1875.
Des Moines River, Webster City, Iowa. California salmon, 1875.
Des Moines River, Windom, Minn. California salmon, 1877.
Des Moines River. (See tributaries: Windom Lake, Okabena Lake, Heron Lake.)
Detroit Lake, Becker County, Minn. California salmon, 1877; Penobscot salmon, 1875; Schoodic salmon, 1875.
Detroit, Mich., Detroit River. California salmon, 1876.
Detroit River, Detroit, Mich. California salmon, 1876; shad, 1873, 1874.
Detroit River, Wayne County, Mich. California salmon, 1878.
Detroit River. (See tributaries: Rouge River, Orchard Lake.)
Devil Lake, Wis. Penobscot salmon, 1875.
De Witt, Clinton County, Iowa, Silver Creek. Schoodic salmon, 1878.
Dexter, Me., pond. Schoodic salmon, 1879.
Dexter, Mich., Base Lake. Whitefish, 1876.
Dexter, Mich., Big Portage Lake. Whitefish, 1876.
Dexter, Mich., Blind Lake. Whitefish, 1876.
Dexter, Mich., Bruin Lake. Whitefish, 1876.
Dexter, Mich., Half Moon Lake. Whitefish, 1876.
Dexter, Mich., Island Lake. Whitefish, 1876; California salmon, 1878.
Dexter, Mich., Patterson Lake. Whitefish, 1876.
Dexter, Mich., Portage Lake. Whitefish, 1876.
Dexter, Mich., Silver Lake. California salmon, 1878; whitefish, 1876.
Dexter, Mich., Woodburn Lake. Whitefish, 1876.
Diamond Lake, Cass County, Mich. California salmon, 1876.
Diamond Lake, Kandiyohi County, Minn. California salmon, 1877.
Diamond Lake, Mich. Penobscot salmon, 1873.

Diamond Pond, Stewartstown, N. H. Schoodic salmon, 1880.
Dickinson County, Kans. (See Chapman, Kans.; Solomon City, Kans.)
Dick's River, Boyle County, Ky. California salmon, 1876.
Dick's River, Lincoln County, Ky. California salmon, 1876.
Dillon's Creek, Hampshire County, W. Va. Schoodic salmon, 1878, 1879.
Dinwiddie County, Va. (See Petersburgh, Va.)
District of Columbia. (See Uniontown.)
Dixon, Iowa, Wapsipinecon River. California salmon, 1874.
Dobsis Stream, Me., Schoodic Lakes. Penobscot salmon, 1874.
Doddridge County, W. Va. (See West Union, W. Va.)
Dodge County, Minn., Mantor Brook. California salmon, 1878.
Dodge County, Minn., Wilson Brook. California salmon, 1878.
Doe Run, Meade County, Ky. California salmon, 1877.
Dog River, Northfield, Vt. Penobscot, salmon, 1874.
Donegal Creek, Pa. Penobscot salmon, 1874.
Donegal, Pa., Donegal Spring. California salmon, 1874.
Donegal, Pa., Susquehanna River. California salmon, 1875.
Donegal Run, Lancaster County, Pa. Schoodic salmon, 1880.
Donegal Springs, Donegal Pa. California salmon, 1874.
Doniphan, Mo., Currant River. California salmon, 1879.
Donnelly Lake, Stephens County, Minn. California salmon, 1878.
Donner Lake, Nevada County, Cal. Schoodic salmon, 1878; whitefish, 1877, 1879.
Dorchester County, Md., Chicacomico River. California salmon, 1879.
Dorchester County, Md. (See Airey's, Md.; Barn's Farm, Md.; Cambridge, Md.; Fleming's Mills, Md.; Linkwood, Md.)
Double Pipe Creek, Md., Double Pipe Creek. California salmon, 1876.
Double Pipe Creek, Md., Patapsco River. California salmon, 1878.
Dougherty County, Ga. (See Albany, Ga.)
Douglas County, Mass. (See Lawrence, Mass.)
Douglas County, Minn., lakes. California salmon, 1879.
Douglas County, Minn., stream. California salmon, 1877.
Dover, Del., Jones Creek. Shad, 1880.
Dover, Me., Piscataquis River. Penobscot salmon, 1874.
Dover, N. J., Rockaway River. Penobscot salmon, 1875.
Dowagiac Creek, Pokagon, Mich. Schoodic salmon, 1874.
Dowagiac River, Cass County, Mich. California salmon, 1875.
Dowagiac River, Mich. Penobscot salmon, 1875.
Dowagiac River, Pokagon, Mich. California salmon, 1875.
Dowagiac River, Van Buren County, Mich. California salmon, 1879.
Dowagiac River. (See tributaries: William's Creek, Emerson's Creek, Cullom's Creek, Burkie's Creek, Crystal Springs Creek, Mendenhall Creek, Pokagon Creek, and Peavine Creek.)
Doyle Creek, Florence, Kans. Shad, 1879.
Dragoon River, Burlingame, Kans. California salmon, 1880.
Drake's Creek, Hopkin's County, Ky. California salmon, 1877.

Drake's Pond, Sussex County, N. J. Schoodic salmon, 1879.
Drakesville, Morris County, N. J., Lake Hopatcong. Schoodic salmon, 1879.
Dresden, Tenn., East Obion River. Shad, 1879.
Drew's Lake, Aroostook County, Me. Schoodic salmon, 1878.
Driftwood Branch, Cameron County, Pa. California salmon, 1879, 1880.
Dripping Spring, Md., Gunpowder River. California trout, 1880; Schoodic salmon, 1880.
Druid Hill Lake, Baltimore, Md. Schoodic salmon, 1879.
Dry Fork, White Sulphur Springs, W. Va. Schoodic salmon, 1879.
Dubuque County, Iowa. (See Dubuque, Iowa; Epworth, Iowa; Farley, Iowa; Worthington, Iowa.)
Dubuque Creek, Dubuque, Iowa. Penobscot salmon, 1875.
Dubuque, Iowa, Dubuque Creek. Penobscot salmon, 1875.
Duck Creek, Clayton, Del. Shad, 1879.
Dudley Lake, Rice County, Minn. Penobscot salmon, 1875; California salmon, 1876, 1878.
Dug Pond, Natick, Mass. Schoodic salmon, 1876, 1877, 1878, 1879.
Duluth, Minn., Canosia Lake. Schoodic salmon, 1879.
Dumont Lake, Allegan County, Mich. California salmon, 1878.
Dunlap's Branch, Woodford County, Ky. California salmon, 1876.
Dunmore Lake, Salisbury, Vt. Schoodic salmon, 1876.
Duplin County, N. C., Six Runs. Shad, 1879.
Duplin County, N. C., Goshen Creek. Shad, 1877.
Duplin County, N. C. (See Warsaw, N. C.)
Durham, Conn., Cocnochogue River. California salmon, 1874.
Durham, Conn., Pitsquog Pond. Schoodic salmon, 1880.
Durham, Conn., West River. California salmon, 1874.
Dutchess County, N. Y., Fishkill Lake. California salmon, 1874.
Dutchess County, N. Y., Furnace Pond. Schoodic salmon, 1879.
Dutchess County, N. Y., Little Thala Pond. Schoodic salmon, 1879.
Dutchess County, N. Y., Long Pond. Schoodic salmon, 1879.
Dutchess County, N. Y., Silver Lake. California salmon, 1874.
Dutchess County, N. Y., Sylvan Lake. Schoodic salmon, 1879.
Dutchess County, N. Y., Upton's Pond. Schoodic salmon, 1879.
Duxbury, Mass., Island Creek Pond. Schoodic salmon, 1877.
Eagle Creek, Gallatin County, Ky. California salmon, 1877.
Eagle Lake, Blue Earth County, Minn. California salmon, 1876.
Eagle Lake, Cottonwood County, Minn. California salmon, 1877.
Eagle Lake, Kandiyohi County, Minn. California salmon, 1876, 1877.
Eagle Lake, Lassen County, Cal. Whitefish, 1879.
Eagle Lake, Washington County, Minn. California salmon, 1876.
Eagleville, Ohio, Grand River. California salmon, 1874; shad, 1874.
Early Lake, Dakota County, Minn. California salmon, 1878.
Eastanalbee River, Athens, Tenn. California salmon, 1876; shad, 1876.
East Bridgewater, Mass., Satucket River. Schoodic salmon, 1877, 1878.

East Brookfield, Mass., Furnace Pond. Schoodic salmon, 1879, 1879.
East Coon River, Iowa. California salmon, 1879.
East Hampton, Conn., Hampton Pond. Schoodic salmon, 1876, 1877, 1878.
East Hampton, Conn., Lake Pocatapaug. Schoodic salmon, 1879.
East Haven, Conn., Saltonstall Lake. Schoodic salmon, 1877, 1878, 1879.
East Lake, Minn. California salmon, 1877.
East Obion River, Dresden, Tenn. Shad, 1879.
Easton, Md., Miles River. Shad, 1878.
Easton, Md., tributary of Miles Creek, pond. Schoodic salmon, 1878.
Easton, Md., Tread Haven Creek. Shad, 1878.
Easton, Pa., Bushkill Creek. California salmon, 1874, 1878, 1879.
Easton, Pa., Heitzman Spring Brook. Penobscot salmon, 1873.
East Pond, Wakefield, N. H. Schoodic salmon, 1879.
East River, Guilford, Conn. Penobscot salmon, 1875.
East River, Hereford, Md. California salmon, 1879.
East Skunk River, Iowa. California salmon, 1879.
Eaton County, Mich., Thorn Apple Lake. California salmon, 1875.
Eaton, Me., Mattawamkeag River. Penobscot salmon, 1874.
Echo Lake, El Dorado Co., Cal. Schoodic salmon, 1878.
Echo Lake, Franconia, N. H. Schoodic salmon, 1879, 1880.
Eddy Creek, Caldwell County, Ky. California salmon, 1877, 1878.
Eden, Md., pond. California trout, 1880; Schoodic salmon, 1880.
Edgecombe County, N. C. (See Rocky Mount, N. C.)
Edisto River, Branchville, S. C. California salmon, 1877.
Edisto River, Orangeburg, S. C. California salmon, 1879.
Edisto River, S. C. California salmon, 1880.
Egg Harbor City, N. J., Mullica River. California salmon, 1877.
El Dorado County, Cal., Echo Lake. Schoodic salmon, 1878.
El Dorado, Kans., Walnut River. California salmon, 1878, 1879; shad, 1879.
Elgin, Ill., Fox Lake. California salmon, 1875.
Elgin, Ill., Fox River. California salmon, 1874; Penobscot salmon, 1875.
Elgin, Ill., pond. Schoodic salmon, 1878.
Elgin, Ill., Twin Lake. California salmon, 1875.
Elizabethtown, Ky., Nolin Creek. Schoodic salmon, 1878.
Elkhart, Ind., Elkhart River. Shad, 1878.
Elkhart County, Ind. (See Elkhart, Ind.; Goshen, Ind.)
Elkhart, Ind., Saint Joseph River. Shad, 1874.
Elkhart River, Elkhart, Ind. Shad, 1878.
Elkhart Lake, Sheboygan County, Wis. Penobscot salmon, 1875.
Elkhorn Creek, Scott County, Ky. Shad, 1878.
Elk Ridge Landing, Md., Cascade Branch of Patapsco River. Schoodic salmon, 1878.

Elk River, Charleston, W. Va. California salmon, 1879, 1880.
Elk River, Elkton, Md. California salmon, 1876; shad, 1879.
Elk River, Md. Shad, 1877.
Elk River. (See tributary: Bohemia Creek, of Big Elk River.)
Elkton, Md., Elk River. California salmon, 1876; shad, 1879.
Ellenburgh, N. Y., Chazy River. Penobscot salmon, 1875.
Ellicott City, Md., North Branch Patuxent River. California salmon, 1876.
Ellicott City, Md., Patapsco Falls. California trout, 1880.
Ellicott City, stream. California trout, 1880.
Ellis County, Kans. (See Ellis, Kans.; Hays City, Kans.)
Ellis, Kans., Big Creek. California salmon, 1878, 1879.
Ellis, Kans., Smoky Hill River. California salmon, 1880.
Ellsworth County, Kans., Smoky Hill River. Schoodic salmon, 1879.
Ellsworth County, Kans. (See Bluffville, Kans.; Ellsworth, Kans.; Farisville, Kans.; Fort Harker, Kans.; Trivoli, Kans.; Venango, Kans.; Wilson, Kans.)
Ellsworth, Kans., Ash Creek. Schoodic salmon, 1880.
Ellsworth, Kans., pond. Schoodic salmon, 1880.
Ellsworth, Kans., Smoky Hill River. California salmon, 1877, 1878, 1879, 1880; shad, 1879.
Elm Creek, Farisville, Kans. Schoodic salmon, 1880.
Elmo Lake, Washington County, Minn. California salmon, 1879.
Elmore, Ohio, Portage River. California salmon, 1877.
Elmwood Creek, Bourbon County, Ky. California salmon, 1878.
Elyria, Ohio, Black River. Shad, 1874.
Elysian Lake, Waseca County, Minn. California salmon, 1876, 1879, 1880; Penobscot salmon, 1875; Schoodic salmon, 1875.
Embarrass River, Charleston, Ill. Shad, 1878.
Emerson Pond, Rindge, N. H. Schoodic salmon, 1880.
Emily Lake, Le Sueur County, Minn. California salmon, 1876, 1877, 1878.
Emmet County, Iowa, lakes. Penobscot salmon, 1876.
Emmet County, Mich. (See Petoskey, Mich.)
Emmittsburgh, Md., Crystal Iron Springs. Schoodic salmon, 1878.
Emmon's Creek, Mich. California salmon, 1874.
Emporia, Kans., Neosho River. California salmon, 1878, 1879, 1880; shad, 1879.
Enfield, Me., Cold Spring Pond. Schoodic salmon, 1878.
Enfield, N. H., Mascoma Lake. Schoodic salmon, 1879.
Engle Lake, Stevens County, Minn. California salmon, 1878.
Enoree River, S. C. California salmon, 1880.
Epsom, N. H., Chesnut Pond. Schoodic salmon, 1880.
Epworth, Iowa, Little Maquoketa River. California salmon, 1874.
Erie County, Ohio. (See Castalia, Ohio; Huron, Ohio.)

Erie County, Pa., Conneaut Creek. Schoodic salmon, 1880.
Erie County, Pa., French Creek. Schoodic salmon, 1880.
Erie County, Pa., Le Bœuf Creek. Schoodic salmon, 1880.
Erie County, Pa. (See Corry, Pa.; Erie, Pa.)
Erie Lake, Put-in-Bay, Ohio. California salmon, 1877; Penobscot salmon, 1875; Schoodic salmon, 1876.
Erie Lake, Toledo, Ohio. Whitefish, 1876.
Erie Lake. (See tributaries: Barrier Lake; Detroit River, Raisin River, Cuyahoga, Ashtabula, Grand, and Sandusky Rivers, Castalia Spring Stream, Portage River, Maumee River, Cold Creek, Huron River, Sandusky River, Grand River, Auglaize River.)
Erie, Pa., Bay. Schoodic salmon, 1879.
Erving's Mill, W. Va., Little Kanawha River. California salmon, 1878.
Escambia County, Ala. (See Pollard, Ala.)
Escambia River, Pollard, Ala. Shad, 1878.
Escambia River. (See tributary: Conecuh River.)
Espinoza Lake, Monterey County, Cal. Schoodic salmon, 1878.
Essex County, Mass. (See Boxford, Mass.; Essex, Mass.; Georgetown, Mass.; Ipswich River, Mass.; Lynnfield, Mass.; Lynn, Mass.; Middleton, Mass.; North Andover, Mass.; Salem, Mass.; Wenham, Mass.)
Essex County, N. J. (See Bloomfield, N. J.)
Essex County, Vt. (See Concord, Vt.)
Essex, Mass., Chebacco Lake. Schoodic salmon, 1877, 1879.
Essex, Vt., Winooski River. Schoodic salmon, 1876.
Etowah River, Cartersville, Ga. California salmon, 1878; shad, 1878.
Evitt's Creek, Tannery, Md. California salmon, 1874.
Fairfax County, Va. (See Ferry Landing, Va.; Jackson City, Va.)
Fairfield County, Conn. (See Brookfield, Conn.; Danbury, Conn.; Mianus, Conn.; Newtown, Conn.; Ridgefield, Conn.; Sandy Hook, Conn.; Sherman, Conn.; Southport, Conn.; Westport, Conn.)
Fairfield Pond, Fairfield, Vt. Schoodic salmon, 1876.
Fairfield, Vt., Fairfield Pond. Schoodic salmon, 1876.
Fairview, Md., Bush River. California trout, 1880; Schoodic salmon, 1880.
Fairview, W. Va., King's Creek. California salmon, 1878.
Fall River, Bridgewater, Mass. California salmon, 1877.
Fall River, Mass., Borden Pond. Schoodic salmon, 1878.
Fall River, Mass., Sucker Brook. Schoodic salmon, 1878.
Falls Village, Conn., Canaan Mountain Pond. Schoodic salmon, 1880.
Falmouth, Mass., Fresh Pond. Schoodic salmon, 1879, 1880.
Faribault County, Minn., Bass Lake. California salmon, 1876, 1877.
Faribault County, Minn., Minnesota Lake. California salmon, 1875, 1876.
Faribault County, Minn., Minnesota River. California salmon, 1875.
Faribault, Minn., Cannon River. California salmon, 1877.
Faribault, Minn, Fox Lake. California salmon, 1877.

Faribault Lake, Rice County, Minn. Penobscot salmon, 1875; Schoodic salmon, 1875.
Farisville, Kans., Clear Creek. Schoodic salmon, 1880.
Farisville, Kans., Elm Creek. Schoodic salmon, 1880.
Farley, Iowa, Little Maquoketa River. California salmon, 1874.
Farlow, Ill., Kaskasia River. Shad, 1878.
Farmington River, Colebrook, Conn. California salmon, 1873, 1873.
Farmington River, Conn. California salmon, 1876.
Farmington River, Dakota County, Minn. California salmon, 1875; Penobscot salmon, 1875.
Farmington River, New Hartford, Conn. California salmon, 1875; Penobscot salmon, 1875, 1877.
Farmington River, Pine Meadow, Conn. California salmon, 1874, 1874.
Farm Pond, Framingham, Mass. Schoodic salmon, 1879.
Farm River, New Haven, Conn. California salmon, 1875.
Farmville, Va., Appomattox River. Schoodic salmon, 1879.
Farquhar Lake, Dakota County, Minn. California salmon, 1878.
Fauquier County, Va. (See Broad Run Station, Va.; Rectorstown, Va.)
Fayette County, Iowa. (See Clermont, Iowa; Fayette, Iowa; West Union, Iowa.)
Fayette County, Ky. (See Lexington, Ky.)
Fayette, Iowa, Turkey River. California salmon, 1875.
Fayette, Iowa, Volga River. California salmon, 1875.
Federalsburgh, Md., branch of Nanticoke River. California salmon, 1876.
Federalsburgh, Md., Nanticoke River. California salmon, 1879, 1880; shad, 1878, 1879.
Felch's Lake, San Mateo County, Cal. Schoodic salmon, 1878.
Ferguson Creek, Winona County, Minn. California salmon, 1878.
Ferrisburgh, Vt., Lewis Creek. Penobscot salmon, 1875.
Ferry Landing, Fairfax County, Va., Potomac River. Shad, 1875, 1875, 1876.
Fife Lake, Mich., Fife Lake. Whitefish, 1876.
Fillmore County, Minn., Benton Creek. California salmon, 1878.
Fillmore County, Minn., Camp Creek. California salmon, 1878.
Fillmore County, Minn., Jordan's Creek. California salmon, 1878.
Fillmore County, Minn., Kingsley Creek. California salmon, 1878.
Fillmore County, Minn., Middle Branch of Root River. California salmon, 1878.
Fillmore County, Minn., North Branch of Root River. California salmon, 1878.
Fillmore County, Minn., North Branch of Watson Creek. California salmon, 1878.
Fillmore County, Minn., Rush Creek. California salmon, 1878.
Fillmore County, Minn., South Branch of Root River. California salmon, 1878.

Fillmore County, Minn., Spring Creek. California salmon, 1878.
Fillmore County, Minn., Spring Valley. California salmon, 1878.
Fillmore County, Minn., Fenberg Brook. California salmon, 1878.
Fillmore County, Minn., Walker Creek. California salmon, 1878.
Fillmore County, Minn., Watson Creek. California salmon, 1878.
Fillmore County, Minn., Willow Creek. California salmon, 1878.
Fillmore County, Minn. (See Lanesborough, Minn.; Pilot Mound, Minn.; Spring Valley, Minn.)
Fincastle, Va., Craig's Creek. Schoodic salmon, 1879.
Fish Creek, Bellton, W. Va. California salmon, 1879, 1880.
Fish Creek, Burton, W. Va. California salmon, 1879, 1880.
Fish Creek, Littleton, W. Va. California salmon, 1877, 1878, 1879, 1880; Schoodic salmon, 1879.
Fish Creek, N. Y. California salmon, 1873, 1874.
Fishing Creek, Wetzel County, W. Va. Schoodic salmon, 1878.
Fishing Creek, Mannington, W. Va. California salmon, 1878.
Fishkill Lake, Dutchess County, N. Y. California salmon, 1874.
Fish Lake, Wis. California salmon, 1879.
Flax Pond, Lynn, Mass. Schoodic salmon, 1878.
Fleming's Mills, Md., Chicacomico River. California salmon, 1879.
Flint County, Mich., Flint River. California salmon, 1875.
Flint River, Albany, Ga. Shad, 1878, 1880.
Flint River, Flint County, Mich. California salmon, 1875.
Flint River, Jonesborough, Ga. California salmon, 1878.
Flint River, Mich. Shad, 1873.
Flint River, Montezuma, Ga. Shad, 1878.
Florence, Kans., Cottonwood River. California salmon, 1878, 1879, 1880; shad, 1879.
Florence, Kans., Doyle Creek. Shad, 1879.
Floyd County, Ga. (See Rome, Ga.)
Floyd River, Le Mars, Iowa. California salmon, 1875.
Floyd River, Sioux City, Iowa. California salmon, 1875.
Floyd's Fork, Jefferson County, Ky. California salmon, 1876.
Floyd's Fork, North and East Branches of, Henry County, Ky. California salmon, 1876, 1876.
Fond du Lac County, Wis. (See Metomen, Wis.)
Fond du Lac, Minn., Saint Louis River. California salmon, 1878; Schoodic salmon, 1875.
Forest Lake, Chisago County, Minn. California salmon, 1877.
Forest Lake, Washington County, Minn. California salmon, 1876.
Forestville, Md., pond. Schoodic salmon, 1878.
Forked Deer River, Humboldt, Tenn. California salmon, 1876.
Forked Deer River, Jackson, Miss. California salmon, 1876.
Forked Deer River, Jackson, Tenn. California salmon, 1876; shad, 1876, 1877.
Forked Deer River. (See tributary: Middle Fork.)

Fort Dodge, Iowa, Des Moines River. California salmon, 1874.
Fort Edward, N. Y., Fortville Creek. California salmon, 1874.
Fort Edward, N. Y., Inglesby Creek. California salmon, 1874.
Fort Edward, N. Y., Peatwig Creek. California salmon, 1874.
Fort Harker, Kans., Howard's Lake. Schoodic salmon, 1880.
Fort Harker, Kans., Smoky Hill River. California salmon, 1880.
Fort Pendleton, Md., Potomac River. California salmon, 1877, 1880.
Fort Pendleton, Md., North Branch Potomac River. California salmon, 1876, 1876, 1878; Penobscot salmon, 1875.
Fort Pendleton, Md., North Branch Potomac River. California salmon, 1874.
Fortville Creek, Fort Edward, N. Y. California salmon, 1874.
Fortville Creek, N. Y. California salmon, 1873.
Fort Washington, Md., Potomac River. Shad, 1878, 1880.
Foss Lake, Stevens County, Minn. California salmon, 1879.
Foster, R. I., Lilly Pond. Schoodic salmon, 1876.
Foster, R. I., Searle's Pond. Schoodic salmon, 1876.
Fox Lake, Elgin, Ill. California salmon, 1875.
Fox Lake, Faribault, Minn. California salmon, 1877.
Fox River, Appleton, Wis. Shad, 1873, 1877.
Fox River, Cary Station, Ill. California salmon, 1879.
Fox River, Elgin, Ill., California salmon, 1874; Penobscot salmon, 1875.
Fox River, Ill. California salmon, 1876, 1877.
Fox River. (See tributaries: Crystal Lake, Column Lake.)
Fox River. (See tributary: Wantoma Lake.)
Framingham, Mass., Farm Pond. Schoodic salmon, 1879.
Framingham, Mass., Sudbury River. Schoodic salmon, 1876, 1877.
Franconia, N. H., Echo Lake. Schoodic salmon, 1879, 1880.
Frankford, Kans., Black Vermillion River. California salmon, 1878, 1879.
Franklin County, Kans. (See Ottawa, Kans.)
Franklin County, Ky., ponds. California salmon, 1878.
Franklin County, Ky., small streams. California salmon, 1877.
Franklin County, Mo. (See Pacific, Mo.; Washington, Mo.)
Franklin County, Ohio. (See Columbus, Ohio.)
Franklin County, Pa. (See Chambersburgh, Pa.)
Franklin County, Vt. (See Fairfield, Vt.; Franklin, Vt.; Georgia, Vt.; Highgate, Vt.; Swanton, Vt.)
Franklin, Mo., Meramec River. California salmon, 1878, 1879; shad, 1879.
Franklin, N. H., Pemigewasset River. Penobscot salmon, 1876.
Franklin Pond, Franklin, Vt. Schoodic salmon, 1876.
Franklin, Va., Blackwater River. Shad, 1878, 1878, 1879.
Franklinville, Md., Garrett County, Savage Creek. California salmon, 1874.
Frantz Mill Dam, Clear Spring, Md. California trout, 1880.

Frazee City, Minn., Otter Tail River. California salmon, 1880.
Frederick, Frederick County, Md., Monocacy River. Schoodic salmon, 1880; California trout, 1880.
Frederick, Cecil County, Md., Sassafras River. California salmon, 1876.
Fredericksburgh, Iowa, Upper Iowa River. California salmon, 1874.
Frederick County, Md. (See Buckeystown, Md.; Emmittsburgh, Md.; Frederick, Md.; Ijamsville, Md.; Mechanicstown, Md.; Middletown, Md.; Monrovia, Md.; Mount Pleasant, Md.; New Market, Md.; Libertytown, Md.; Point of Rocks, Md.; Slabtown, Md.; Unionville, Md.; Walkersville, Md.; Woodsborough, Md.)
Frederick County, Va. (See Winchester, Va.)
Freeborn County, Minn., Lake Albert Lea. California salmon, 1875, 1876; Penobscot salmon, 1875.
Freeborn County, Minn., Alden Lake. California salmon, 1878.
Freeborn County, Minn., Cedar River. California salmon, 1875.
Freeborn County, Minn., Iowa River. California salmon, 1875.
Freeborn County, Minn., Pickerel Lake. California salmon, 1876, 1878.
Freeborn County, Minn. (See Albert Lea, Minn.)
Freeland, Md., Gunpowder River. California salmon, 1874.
Freestone Point, Va., Potomac River. Shad, 1875.
Freestone, Va., Potomac River. Shad, 1878.
Fremont, Ohio, Sandusky River. California salmon, 1880; Penobscot salmon, 1875; Schoodic salmon, 1876; shad, 1874, 1878, 1879, 1880.
French Broad River, Church Creek, Tenn. California salmon, 1876.
French Broad River. (See tributary: Swannanoa River.)
French Creek, Erie County, Penn. Schoodic salmon, 1880.
French Lake, Rice County, Minn. California salmon, 1876, 1877, 1878.
Fresh Pond, Falmouth, Mass. Schoodic salmon, 1879, 1880.
Friar's Point, Miss., Sunflower River. Shad, 1878.
Friendship, N. C., North Fork of Deep River. California salmon, 1879.
Frog Lake, Stevens County, Minn. California salmon, 1878.
Fulton, Ark., Red River. Shad, 1877, 1879.
Fulton County, Ga. (See Atlanta, Ga.; Boltonville, Ga.)
Fulton County, Ky., small streams. California salmon, 1877.
Fulton, Miss., Tombigbee River. Shad, 1878.
Fulton, N. Y., Oswego River. California salmon, 1874.
Furnace Pond, Dutchess County, N. Y. Schoodic salmon, 1879.
Furnace Pond, East Brookfield, Mass. Schoodic salmon, 1879, 1879.
Gadsden County, Fla. (See Midway, Fla.)
Gaffney City, S. C., Broad River. California salmon, 1877; shad, 1875, 1880.
Gainesville, Ga., Chattahoochee River. California salmon, 1878; shad, 1879.
Gallatin County, Ky., Eagle Creek. California salmon, 1877.
Gardiner's Lake, Salem, Conn. Schoodic salmon, 1876, 1877, 1878, 1879.
Garrard County, Ky., White Oak Creek. California salmon, 1876.

Garrett County, Md. (See Deer Park, Md.; Fort Pendleton, Md.; Franklinville, Md.; Oakland, Md.; Swanton, Md.)
Gasconade County, Mo. (See Herman, Mo.)
Gasconade River, Jerome, Mo. California salmon, 1876, 1880; shad, 1880.
Gaston County, N. C. (See Dallas, N. C.)
Gates' Pond, Berlin, Mass. Schoodic salmon, 1876, 1877.
Gavin's Lake, Stevens County, Minn. California salmon, 1878.
Geauga County, Ohio, Newberry Ponds. California salmon, 1879.
Genesee County, Mich. (See Linden, Mich.)
Genesee River, Caledonia, N. Y. California salmon, 1874, 1875.
Genesee River, Livingston County, N. Y. California salmon, 1875.
Genesee River, N. Y. California salmon, 1873, 1873, 1874, 1874, 1875.
Genesee River. (See tributaries: Spring Creek, Caledonia Spring Creek, Walter Creek.)
Geneva Lake, Geneva, Wis. California salmon, 1877, 1878, 1879, 1880.
Geneva Lake, Walworth County, Wis. California salmon, 1875, 1876, 1877, 1878, 1879; California trout, 1880; Schoodic salmon, 1876, 1878, 1879; Penobscot salmon, 1874.
Geneva, Wis., Geneva Lake. California salmon, 1877, 1878, 1879, 1880.
Gentry County, Mo., Grand River. California salmon, 1880.
George Lake, Kandiyohi County, Minn. California salmon, 1877.
George Lake, Minn. California salmon, 1877.
Georgetown, Colo., Clear Lake. California salmon, 1874.
Georgetown, Colo., Green Lake. California salmon, 1874.
Georgetown, D. C., Little Falls of the Potomac River. Shad.
Georgetown, Mass., Pentucket Pond. Schoodic salmon, 1877.
Georgetown, Mass., Rock Pond. Schoodic salmon, 1877.
Georgetown, Pa., Susquehanna River. Shad, 1880.
Georgia, Vt., Lamoille River. Penobscot salmon, 1874; shad, 1874, 1875.
Germanton, N. C., Town Creek. California salmon, 1879.
Gervais Lake, Ramsey County, Minn. California salmon, 1878.
Gibson County, Tenn. (See Humboldt Tenn.; Trenton, Tenn.)
Giles County, Va., Mountain Lake. California salmon, 1876.
Gillmore's Creek, Rice County, Minn. California salmon, 1878.
Gilmore Pond, Jaffrey, N. H. Schoodic salmon, 1880.
Gist Creek, Shelby County, Ky. California salmon, 1876.
Glassborough, N. J., Mantua Creek. California salmon, 1876.
Glasser's Lakes, Covington, Ky. Schoodic salmon, 1878.
Glenburn, Me., Pushaw Pond. Schoodic salmon, 1879.
Glencoe, Md., Gunpowder River. California salmon, 1876.
Gloucester County, N. J., Raccoon Creek. California salmon, 1879.
Gloucester County, N. J. (See Glassborough, N. J.; Swedesborough, N. J.; Wenonah, N. J.; Williamstown, N. J.; Woodbury, N. J.)
Glymont, Md., Potomac River. Shad, 1878, 1878.
Goguac Lake, Battle Creek, Calhoun County, Mich. California salmon, 1875; Schoodic salmon, 1878.

Goguac Lake, Calhoun County, Mich. California salmon, 1875, 1876, 1878, 1879.
Goodhue County, Minn., Bell Creek. California salmon, 1878.
Goodhue County, Minn., mill-pond. California salmon, 1879.
Goodhue County, Minn. (See Red Wing, Minn.)
Goose Creek, North Branch of, Chisago County, Minn. California salmon, 1877.
Goose Creek, Rectorstown, Va. California salmon, 1876.
Goose Creek, Stacy, Minn. California salmon, 1879.
Goose Lake, Woodstock, Mich. California salmon, 1878.
Gordon County, Ga. (See Resaca, Ga.)
Gorton's Pond, Warwick, R. I. Schoodic salmon, 1876.
Goshen Creek, Mount Olive, N. C. Shad, 1879.
Goshen Creek, Duplin County, N. C. Shad, 1878.
Gourd Neck Lake, Kalamazoo County, Mich. California salmon, 1879.
Govanstown, Md., stream. California trout, 1880.
Grafton County, N. H. (See Benton, N. H.; Bridgewater, N. H.; Campton, N. H.; Canaan, N. H.; Enfield, N. H.; Franconia, N. H.; Holderness, N. H.; Piermont, N. H.; Plymouth, N. H.; Thornton, N. H.; Warren, N. H.; West Campton, N. H.; Woodstock, N. H.)
Grafton, W. Va., Tygart's Valley. Shad, 1879.
Graham Lake, Minn. California salmon, 1877.
Graham, N. C., Haw River. California salmon, 1877.
Granby, Conn., Salmon River. Schoodic salmon, 1880.
Grand Lake, Me. Schoodic salmon, 1876, 1877.
Grand Lake, Stearns County, Minn. California salmon, 1876, 1878.
Grand Lake, Washington County, Me. Schoodic salmon, 1878, 1879.
Grand Rapids, Mich., Perkins & Hess Pond. California salmon, 1874.
Grand Rapids, Mich., Reed Lake. California salmon, 1876.
Grand River, Eagleville, Ohio. California salmon, 1874.
Grand River, Eagleville, Ohio. Shad, 1874.
Grand River, Ionia, Mich. Shad, 1873.
Grand River, Jackson County, Mich. Penobscot salmon, 1873.
Grand River, Jackson, Mich. California salmon, 1876, 1879.
Grand River, Lansing, Mich. Shad, 1873.
Grand River, Gentry County, Mo. California salmon, 1880.
Grand River Railroad Crossing, Henry County, Mo. Shad, 1880.
Grand River, tributary of, Jackson County, Mich. California salmon, 1873.
Grand River. (See tributaries: Sandstone Creek, Perkins & Hess Pond, Crouch's Creek, Crouch's Fishery, Maple River, Round Lake, Thornapple Lake, Long Lake, Reed Lake, Church Lake, Pickerel Lake, Lamberton Lake, Soft Water Lake.)
Grand Traverse Bay. (See tributaries: North Boardman River, Rapid River, Torch Lake.)
Grand Traverse County, Mich. (See Fife Lake, Mich.)

Grant County, Minn., Huskin's Lake. California salmon, 1878.
Grant County, Minn., Patchen's Lake. California salmon, 1878.
Grant County, Minn., Twin Lake. California salmon, 1878.
Grant County, W. Va., Luney's Creek. California salmon, 1879, 1880.
Grant County, W. Va., Williams' Ponds. California salmon, 1879, 1880.
Grant County, W. Va. (See Williamsport, W. Va.)
Grant County, Wis. (See Boscobel, Wis.)
Grant County, Wis., streams. California salmon, 1874.
Grantham, N. H., Stocker's Pond. Schoodic salmon, 1878.
Granville County, N. C., Tar River. Shad, 1877.
Grapevine Creek, Warren, Ind. California salmon, 1875.
Grayson County, Tex. (See Sherman, Tex.)
Great Barrington, Mass., Lake Buell. Schoodic salmon, 1879, 1880.
Great Bend, Kans., Walnut River. California salmon, 1878, 1879; shad, 1879.
Great Choptank River, Carter's Bridge, Md. California salmon, 1879.
Great Egg Harbor River, Atlantic County, N. J. California salmon, 1879.
Great Egg Harbor River, May's Landing. California salmon, 1876.
Great Egg Harbor River, N. J. California salmon, 1877, 1878.
Great Egg Harbor River, Weymouth, N. J. California salmon, 1877.
Great Egg Harbor River, Williamstown, N. J. California salmon, 1876.
Great Egg Harbor River, Winslow, N. J. California salmon, 1877.
Great Herring Pond, North Sandwich, Mass. Schoodic salmon, 1876, 1878.
Great Pee Dee River, Railroad Crossing, Marion County, S. C. Shad, 1878, 1880.
Great Pee Dee River. (See tributary: Yadkin River.)
Great Pond, Braintree, Mass. Schoodic salmon, 1877, 1878, 1880.
Great Pond, North Andover, Mass. Schoodic salmon, 1876, 1878.
Great River, Long Island, N. Y. California salmon, 1876, 1877.
Greeley, Iowa, Turkey River. California salmon, 1875.
Greeley, Iowa, Volga River. California salmon, 1875.
Greenbrier County, W. Va. (See Caldwell, W. Va.; Lewisburgh, W. Va.; Ronceverte, W. Va.; White Sulphur Springs, W. Va.)
Greenbrier River, Caldwell, Greenbrier County, W. Va. California salmon, 1878.
Greenbrier River, Hinton, W. Va. Schoodic salmon, 1879.
Greenbrier River, Ronceverte, Greenbrier County, W. Va. California salmon, 1878, 1879, 1880; shad, 1873, 1879.
Greenbrier River, W. V. California salmon, 1879, 1880.
Green County, Ky., Booker's Branch. California salmon, 1877.
Green County, Ky., Cave Spring Branch. California salmon, 1877.
Green County, Wis. (See Brodhead, Wis.)
Greene County, N. Y., tributaries Hudson River. California salmon, 1878.

Greene County, Mo. (See Springfield, Mo.)
Greene County, Ga., Oconee River. Shad, 1880.
Greene County, Pa., tributary of Monongahela River. California salmon, 1876.
Green Lake, Chisago County, Minn. California salmon, 1877.
Green Lake, Georgetown, Colo. California salmon, 1874.
Green Lake, Kandiyohi County, Minn. California salmon, 1876, 1877.
Green Lake, Green Lake County, Wis. California salmon, 1874.
Green Lake County, Wis., Green Lake. California salmon, 1874.
Green Pond, Sherman, Conn. Schoodic Lake, 1878, 1879.
Green River, Bowling Green, Ky. Shad, 1878.
Green River, Casey County, Ky. California salmon, 1876.
Green River, Hendersonville, N. C. California salmon, 1878.
Green River, McKinney's Station, Ky. Shad, 1878.
Green River, Munfordville, Ky. Shad, 1877.
Green River, Wis. Schoodic salmon, 1879.
Green River. (See tributaries: Middle, Bumgartner's, Russell, Rough, Noling, Drakes, and Jasper Creeks.)
Greensborough, Guilford County, N. C., ponds tributary to Cape Fear River. Schoodic salmon, 1878.
Greensborough, Md., Choptank River. California salmon, 1876; shad, 1878, 1878.
Greensborough Pond, Greensborough, Vt. Schoodic salmon, 1878.
Greensborough, Vt., Greensborough Pond. Schoodic salmon, 1878.
Greensburgh, Pa., Monongahela River. Shad, 1873.
Green's Pond, Oxford, Warren County, N. J. Schoodic salmon, 1879.
Green Spring Run, Aberdeen, Md. California salmon, 1876.
Green Spring Run, Burnsides, Harford County, Md. Schoodic salmon, 1879.
Green Spring, Baltimore County, Md., pond tributary to Lake Roland. California trout, 1880; Schoodic salmon, 1880; pond of Samuel Shoemaker.
Greenville County, S. C. (See Greenville, S. C.)
Greenville, S. C., Saluda River. California salmon, 1879, 1880.
Greenville, Va., South River. California salmon, 1878.
Greenwood Lake, Bloomfield, N. J. California salmon, 1876, 1877.
Greenwood Lake, Passaic County, N. J. California salmon, 1879.
Greenwood, Md., pond. California trout, 1880.
Greenwood, Mass., Crystal Lake. Schoodic salmon, 1877, 1878.
Grenada County, Miss. (See Grenada, Miss.)
Grenada County, Miss., Yalabusha River. Shad, 1879.
Grenada, Miss., Yalabusha River. Shad, 1878, 1879.
Groton, Mass., ponds. Schoodic salmon, 1880.
Guadalupe County, Tex. (See Seguin, Tex.)
Guadalupe River, Seguin, Tex. Shad, 1879.
Guadalupe River. (See tributary: San Marcus River.)

Guilford, Conn., East River. Penobscot salmon, 1875.
Guilford, Conn., Limepaug Lake. Schoodic salmon, 1880.
Guilford County, N. C. (See Friendship, N. C.; Greensborough, N. C.; Jamestown, N. C.)
Guilford, Ind., Tanner's Creek. California salmon, 1874, 1876.
Gull Lake, Kalamazoo County, Mich. California salmon, 1873, 1875.
Gull Lake, Richland, Mich. California salmon, 1878.
Gull Pond, Wellfleet, Mass. Schoodic salmon, 1877, 1878.
Gun Lake, Hillsdale County, Mich. Penobscot salmon, 1873.
Gunpowder River, Cockeysville, Md. California salmon, 1878, 1879; shad, 1877, 1878, 1879; Schoodic salmon, 1878.
Gunpowder River, Dripping Spring, Md. California trout, 1880.
Gunpowder River, Freeland, Md. California salmon, 1874.
Gunpowder River, Glencoe, Md. California salmon, 1876.
Gunpowder River, branch of, Long Green, Md. California trout, 1880.
Gunpowder River, Md. Penobscot salmon, 1875.
Gunpowder River, Monkton, Md. California salmon, 1877.
Gunpowder River, Parkton, Md. California salmon, 1876, 1878.
Gunpowder River, Phœnix, Md. California salmon, 1876, 1877, 1880.
Gunpowder River, pond tributary to, Hampton, Md. Schoodic salmon, 1879.
Gunpowder River, Railroad Crossing, Baltimore County, Md. Shad, 1879.
Gunpowder River, Towsontown, Md. California salmon, 1878, 1879.
Gunpowder River, Warren, Md. California trout, 1880.
Gunpowder River. (See tributaries: Little Gunpowder River, Western River.)
Gwinnett County, Ga. (See Norcross, Ga.)
Gwynn's Falls, Airy Hill, Md. California trout, 1880; Schoodic salmon, 1880.
Habersham County, Ga., Tugaloo River. Shad, 1879.
Habersham County, Ga. (See Balding's Mills, Toccoa, Ga.)
Hackensack River, Bergen County, N. J. California salmon, 1879.
Hackensack River, tributary of, N. J. Penobscot salmon, 1874.
Hagerstown, Md., Antietam Creek. California salmon, 1874, 1876, 1879.
Hagerstown, Md., Conococheague River. California salmon, 1874, 1876, 1879.
Hale County, Ala. (See Greensborough, Ala.)
Half Moon Lake, Dexter, Mich. Whitefish, 1876.
Half Moon Lake, Putnam, Mich. California salmon, 1878.
Halfway Pond, Plymouth, Mass. Schoodic salmon, 1876, 1877, 1878.
Halfway River, Sandy Hook, Conn. Schoodic salmon, 1880.
Halifax County, N. C. (See Weldon, N. C.)
Halifax County, Va., Dan River. Shad, 1877.
Hall County, Ga. (See Gainesville, Ga.)
Halloran Lake, Ramsey County, Minn. California salmon, 1876.

Halstead, Kans., Little Arkansas River. California salmon, 1878, 1879.
Halstead, Kans., Little River. Shad, 1879.
Hamlin Lake, Battle Creek, Mich. California salmon, 1876.
Hamlin Lake, Calhoun County, Mich. Schoodic salmon, 1876.
Hamilton County, Iowa. (See Webster City, Iowa.)
Hamilton County, Ohio. (See Cincinnati, Ohio.)
Hamilton County, Tenn. (See Chattanooga, Tenn.)
Hamott's Mill, Hampshire County, W. Va., Mill Creek. Schoodic salmon, 1879, 1879.
Hampden County, Mass. (See Holyoke, Mass.; Ludlow, Mass.; Palmer, Mass.; Springfield, Mass.; Westfield, Mass.; Wilbraham, Mass.)
Hampshire County, Mass. (See Enfield, Mass.; Goshen, Mass.; Huntington, Mass.; Smith's Ferry, Mass.; South Hadley Falls, Mass.)
Hampshire County, W. Va., Dillon's Creek. Schoodic salmon, 1878, 1879.
Hampshire County, W. Va. (See Institution for Deaf, Romney, W. Va.)
Hampshire County, W. Va., Mill Creek. Schoodic salmon, 1878.
Hampshire County, W. Va. (See Hamott's Mills, W. Va.; Romney, W. Va.)
Hampshire County, W. Va., south tributary to Potomac River. Schoodic salmon, 1879.
Hampshire County, W. Va., tributaries to Potomac River. California salmon, 1879, 1880.
Hampshire County, W. Va., tributaries to Potomac River. California salmon, 1879, 1880.
Hampton Creek, S. C. California trout, 1880; Schoodic salmon, 1880.
Hampton Pond, East Hampton, Conn. Schoodic salmon, 1876, 1877, 1878.
Hampton, Baltimore County, Md., pond tributary to Gunpowder River. Schoodic salmon, 1879.
Hancock County, Me. (See Bucksport, Me.; Surry, Me.)
Hancock County, W. Va. (See Fairview, W. Va.)
Hand Lake, Sherburne County, Minn. California salmon, 1876.
Hanging Fork, Lincoln County, Ky. California salmon, 1876.
Hanging Horn Lake, Carleton County, Minn. California salmon, 1878.
Hanover County, Va. (See Taylorsville, Va.)
Hansca Lake, Brown County, Minn. California salmon, 1878.
Hardin County, Iowa. (See Iowa Falls, Iowa.)
Hardin County, Ky. (See Elizabethtown, Ky.)
Hardin County, Ky., Middle Creek. California salmon, 1876.
Hardin County, Ky., Nolin Creek. California salmon, 1877.
Hardin County, Ky., Rough Creek. California salmon, 1877.
Hardin County, Ky., Durham's Branch, Rockcastle County, Ky. California salmon, 1877.
Hardy County, W. Va. (See Moorefield, W. Va.)
Hardy County, W. Va., Trout Run. Schoodic salmon, 1878.

Hardy's Pond, Waltham, Mass. Schoodic salmon, 1877 (?), 1878, 1879, 1880.

Harford County, Md. (See Aberdeen, Md.; Bel Air, Md.; Burnsides, Md.; Havre de Grace, Md.; Magnolia, Md.; Norrisville, Md.; Perryman, Md.; Pleasantville, Md.; Savage, Md.; Swan Creek, Md.; Wilna, Md.)

Harford County, Md., Winter's Run. California salmon, 1877.

Harford County, Md., Green Spring Run. California salmon, 1879.

Harper's Ferry, W. Va., Potomac River. California salmon, 1879.

Harriott Lake, Hennepin County, Minn. California salmon, 1876, 1877.

Harrisburg, Pa., Susquehanna River. Shad, 1879, 1880.

Harrisburg, Pa., Susquehanna River. California salmon, 1873, 1876.

Harris Dam, Cecil County, Md., Octorara River. California salmon, 1880.

Harrison County, Iowa. (See Logan, Iowa.)

Harrison County, Tex. (See Marshall, Tex.)

Harrison County, W. Va. (See Clarksburgh, W. Va.; New Salem, W. Va.)

Hart County, Ky., Bumgartner's Creek. California salmon, 1876.

Hart County, Ky. (See Mumfordsville, Ky.)

Hartford, Conn., Colt's Reservoir. Schoodic salmon, 1880.

Hartford County, Conn. (See Avon, Conn.; Bristol, Conn.; Broad Brook, Conn.; East Hartford, Conn.; East Windsor, Conn.; Farmington, Conn.; Forestville, Conn.; Granby, Conn.; Hartford, Conn.; Manchester, Conn.; Melrose, Conn.; Newington, Conn.; Thompsonville, Conn.; West Hartford, Conn.; Windsor, Conn.)

Hartman, Wis., tributaries of Wisconsin River. California salmon, 1878.

Hart's Pond, Canaan, N. H. Schoodic salmon, 1880.

Harvard, Mass., Bear Hill Pond. Schoodic salmon, 1878, 1879.

Harvey County, Kans. (See Halstead, Kans.)

Harvey's Lake, Dallas, Pa. California salmon, 1880.

Harvey's Lake, Wilkesbarre, Pa. Schoodic salmon, 1878, 1879.

Harvey's Pond, Barnet, Vt. Schoodic salmon, 1876, 1878.

Hassel Lake, Swift County, Minn. California salmon, 1878.

Havre de Grace, Md., North East River. Shad, 1878.

Havre de Grace, Md., Spesutie Narrows. Shad, 1877 (12 deposits), 1878 (10 deposits), 1879 (15 deposits), 1880 (10 deposits).

Havre de Grace, Md., Susquehanna River. Shad, 1876, 1877, 1878, 1879, 1880.

Hawley, Minn., Buffalo River. California salmon, 1877.

Haw River, Graham, N. C. California salmon, 1877.

Haw River, Allamance County, N. C. Shad, 1877.

Hayes City, Kans., Big Creek. California salmon, 1878, 1879.

Hayes City, Kans., Smoky Hill River. California salmon, 1880.

Haywood County, Tenn. (See Brownsville, Tenn.)

Hazleton, Pa. Schoodic salmon, 1878.
Hearne, Tex., Brazos River. Shad, 1879.
Heart Lake, Susquehanna County, Pa. Schoodic salmon, 1880.
Heitzman Spring Brook, Easton, Pa. Penobscot salmon, 1873.
Hemlock Lake. (See tributary, Spring Brooks.)
Hempstead County, Ark. (See Fulton, Ark.)
Hempstead, Tex., Brazos River. Shad, 1874.
Hempstead, Tex., Clear Creek. California salmon, 1874, 1876.
Henderson County, N. C. (See Hendersonville, N. C.)
Henderson, Md., Choptank River. California salmon, 1878, 1879, 1880; shad, 1879.
Hendersonville, N. C., Green River. California salmon, 1878.
Hennepin County, Minn., Lake Armstrong. California salmon, 1877.
Hennepin County, Minn., Calhoun Lake. California salmon, 1876.
Hennepin County, Minn., Harriott Lake. California salmon, 1876, 1877.
Hennepin County, Minn., Hokah Lake. California salmon, 1876.
Hennepin County, Minn., Lake Independence. California salmon, 1877.
Hennepin County, Minn., Lake Johnson. California salmon, 1877.
Hennepin County, Minn., Lydard Lake. California salmon, 1878.
Hennepin County, Minn. (See Minneapolis, Minn.)
Hennepin County, Minn., Minnetonka Lake. California salmon, 1875, 1876, 1878; Penobscot salmon, 1875; Schoodic salmon, 1875.
Hennepin County, Minn., Lake Rebecca. California salmon, 1878.
Henrico County, Va. (See Richmond, Va.)
Henry County, Ill. (See Cambridge, Ill.)
Henry County, Ala. (See Columbia, Ala.)
Henry County, Ky., East and West Forks of Little Kentucky. California salmon, 1876.
Henry County, Ky., North and East Branches of Floyd's Fork. California salmon, 1876.
Henry County, Mo., Grand River. Shad, 1880.
Hereford, Md., East River. California salmon, 1879.
Herkimer County, N. Y. (See Ilion, N. Y.)
Herkimer County, N. Y., Jock's Lake. California salmon, 1874.
Herkimer County, N. Y., Mud (or Hydraulic) Lake. California salmon, 1874.
Herkimer County, N. Y., Spruce Creek. California salmon, 1874.
Herkimer County, N. Y., West Canada Creek. California salmon, 1874.
Herkimer County, N. Y., Woodhull Lake. Schoodic salmon, 1879.
Herman, Mo., Missouri River. Shad, 1872.
Heron Lake, Jackson County, Minn. California salmon, 1877.
Herring Creek, Berlin, Md. California salmon, 1879.
Herring Run, Md., Back River. California salmon, 1878.
Hersey Creek, Reed City, Mich. California salmon, 1874.
Hickman County, Tenn. (See Bon-Aqua, Tenn.)

Hickman Creek, Jessamine County, Ky. California salmon, 1878.
Hickory-Nut Gap, N. C., Broad River. California salmon, 1879.
Higganum, Conn., Higganum Reservoir. Schoodic salmon, 1880.
Higganum Reservoir, Higganum, Conn. Schoodic salmon, 1880.
Higgin's Lake, Roscommon County, Mich. Penobscot salmon, 1874; California salmon, 1879; Schoodic salmon, 1880.
High Bridge, Ky. Shad, 1878.
Highgate, Vt., Hunkerford Brook. California salmon, 1873.
Highgate, Vt., Kelly Brook. California salmon, 1873.
Highgate, Vt., Missisquoi River. California salmon, 1873.
Hillsborough Bridge, N. H., Contoocook River. California salmon, 1878, 1879.
Hillsborough County, N. H. (See Antrim, N. H.; Hillsborough Bridge, N. H.; Manchester, N. H.; Milford, N. H.; Peterborough, N. H.)
Hillsborough, Md., Nanticoke River. California salmon, 1878.
Hillsborough, Md., Tuckahoi Creek. California salmon, 1876, 1878; shad, 1878, 1879.
Hillsdale County, Mich, Barrier Lake. Penobscot salmon, 1873.
Hillsdale County, Mich., Butternut Creek. California salmon, 1873.
Hillsdale County, Mich., Gun Lake. Penobscot salmon, 1873.
Hillsdale County, Mich. (See Hillsdale, Mich.)
Hillsdale County, Mich., Saint Joseph River, headwaters of. Penobscot salmon, 1873.
Hillsdale County, Mich., Sand Creek. California salmon, 1873.
Hillsdale County, Mich. (See Somerset, Mich.)
Hillsdale, Mich., Baro Beese Lake. California salmon, 1878.
Hinds County, Miss. (See Jackson, Miss.)
Hinton, W. Va., Greenbrier River. Schoodic salmon, 1879.
Hinton, W. Va., New River. California salmon, 1879, 1880; shad, 1879.
Hockomocko Pond, Westborough, Mass. Schoodic salmon, 1879.
Hog Lake, Lyme, Conn. Schoodic salmon, 1877, 1878, 1879.
Hokah Lake, Houston County, Minn. California salmon, 1878.
Hokah Lake, Hennepin County, Minn. California salmon, 1876.
Holderness, N. H., Squam Lake. Schoodic salmon, 1879.
Holliston, Mass., ponds. Schoodic salmon, 1880.
Holly, Mich., Shiawassee River. California salmon, 1876.
Holly Springs, Miss. Cold Water River. Shad, 1878.
Holston River, Knoxville, Tenn. Shad, 1875, 1876, 1879.
Holston River, Smyth County, Va. Schoodic salmon, 1877.
Holston River, North Fork of Saltville, Va. Schoodic salmon, 1880.
Holston River, North Fork of, Sharon Springs, Va. California salmon, 1880.
Holston River, South Fork of, Atkins' Tank, Va. California salmon, 1880.
Holyoke, Mass., Ashley Pond. Schoodic salmon, 1878, 1879.
Holyoke, Mass., Wright Pond. Schoodic salmon, 1879.

Honeoye Falls, N. Y. California salmon, 1874.
Hontoon Lake, Oakland County, Mich. California salmon, 1875.
Hood's Mill's, Md., Patapsco River. California salmon, 1874, 1878, 1878, 1879.
Hood's Mill's, Md., pond. Schoodic salmon, 1878.
Hopatcong Lake, Morris County, N. J. California salmon, 1879; whitefish, 1876.
Hopatcong Lake, Drakesville, Morris County, N. J. Schoodic salmon, 1879.
Hopkins County, Ky., Drake's Creek. California salmon, 1877.
Hopkinton, Iowa, Maquota River. California salmon, 1875.
Horry County, S. C. (See Little River, S. C.)
Horse Shoe Lake, Rice County, Minn. California salmon, 1878.
Horse Shoe Lake, Sibley County, Minn. California salmon, 1877.
Houghton's Pond, Milton, Mass. Schoodic salmon, 1878, 1879.
Housatonic River, Conn. California salmon, 1876.
Housatonic River, New Milford, Conn. California salmon, 1875; Penobscot salmon, 1877; shad, 1873, 1874.
Housatonic River, tributary to, Newtown, Conn. Schoodic salmon, 1879.
Housatonic River. (See tributary: Butler Brook.)
Housatonic River. (See tributary: Main River, Butler Brook.)
Houston County, Minn., Barnum Pond. Schoodic salmon, 1879.
Houston County, Minn., Como Lake. California salmon, 1878; Schoodic salmon, 1879.
Houston County, Minn., Hokah Creek. California salmon, 1878.
Houston County, Minn., Silver Lake. California salmon, 1878.
Houston County, Tenn. (See Tennessee Ridge, Tenn.)
Howard County, Md. (See Elk Ridge Landing, Md.; Ellicott, Md.; Savage, Md.)
Howard County, Md., tributaries of Patuxent River. California salmon, 1874.
Howard County, Mo. (See Armstrong, Mo.; Franklin, Mo.)
Howard Lake, Wright County, Minn. Penobscot salmon, 1875.
Howard, Cass County, Mich., Barrow Lake. California salmon, 1878.
Howard's Lake, Fort Harker, Kans. Schoodic salmon, 1880.
Howard's Lower Creek, Clark County, Ky. California salmon, 1876.
Howard's Upper Creek, Clark County, Ky. California salmon, 1876.
Howland, Maine, Seboois River. Penobscot salmon, 1874, 1875.
Hubbardston, Mass., Asnacconconic Pond. Schoodic salmon, 1878, 1879.
Hubbardton, Vt., pond. Schoodic salmon, 1876.
Hudson River, tributaries to, Green County, N. Y. California salmon, 1878.
Hudson River, tributary to, N. Y. Penobscot salmon, 1873.
Hudson River. (See tributaries: Mohawk, Saranac, Salmon, Chazy Rivers; Battenkill Creek; Fortsville, Peatwig, Sanquoit, West Canada, Spruce, Inglesby, Sequoit and Willow Creeks; Oriskany and Mohawk Rivers; Fishkill, Silver, Jock's, Mud, and Seneca Lakes.)

Hugh's River, Pennsborough, W. Va. California salmon, 1878.
Humboldt, Tenn., Forked Deer River. California salmon, 1876.
Humboldt, Tenn., Middle Fork of Forked Deer River. Shad, 1878.
Hummock Pond, Nantucket, Mass. Schoodic salmon, 1877.
Humphreys County, Tenn. (See Johnsonville, McEwen's Station, Tenn.)
Hunkerford Brook, Highgate, Vt. California salmon, 1873.
Hunterdon County, N. J. (See Bloomsbury, N. J.)
Huntingdon County, Pa. (See Huntingdon, Pa.)
Huntingdon, Pa., Juniata River. Penobscot salmon, 1880.
Huntingdon, Tenn., South Fork of Obion River. Shad, 1878.
Huntington, Mass., Norwich Pond. Schoodic salmon, 1877.
Huntington County, Ind. (See Warren, Ind.)
Huron County, Ohio. (See Monroeville, Ohio.)
Huron Lake, tributary to, South Lawn, Ill. Penobscot salmon, 1874.
Huron Lake, tributary to, Wildwood, Ill. Penobscot salmon, 1874.
Huron Lake. (See tributaries: Saugeen River, Au Sable River, Rifle River, Shiawassee River.)
Huron, Ohio, Huron River. California salmon, 1878.
Huron River, Huron, Ohio. California salmon, 1878.
Huron River, Monroeville, Ohio. California salmon, 1874; shad, 1874.
Huron River, Washtenaw County, Mich. California salmon, 1876.
Hurricane Creek, Crittenden County, Ky. California salmon, 1877.
Huskin's Lake, Grant County, Minn. California salmon, 1878.
Hutchinson, Kans., Cow Creek. California salmon, 1878, 1879; shad, 1879.
Ijamsville, Md., pond. California trout, 1880.
Illinois River, Ill. California salmon, 1876, 1877.
Illinois River, Ind., Kankakee River.
Illinois River. (See tributaries: Rock River, Fox River, Kankakee River, Geneva Lake, Elkhart, Cedar Rock, and Devil's Lakes.)
Independence, Iowa, Wapsipinecon River. California salmon, 1875.
Independence, Kans., Verdigris River. California salmon, 1778, 1879.
Independence, Mo., Blue River. California salmon, 1880.
Independence Lake, Hennepin County, Minn. California salmon, 1877.
Independence River, Iowa. California salmon, 1879.
Indiana County, Pa. (See Black Lick Station, Pa.)
Indianapolis, Ind., White River. California salmon, 1874; shad, 1872, 1874, 1875, 1879.
Indian Creek, Cass County, Mich. California salmon, 1875.
Indian Lake, Kalamazoo County, Mich. California salmon, 1775.
Indian Lake, Cass County, Mich. California salmon, 1878.
Ingham County, Mich. (See Lansing, Mich.)
Inglesby Creek, Fort Edward, N. Y. California salmon, 1874.
Inman Lake, McPherson County, Kan. Schoodic salmon, 1879; California salmon, 1878, 1879.
Institution for Deaf, Romney, W. Va., pond. Schoodic salmon, 1879, 1879.

Ionia County, Mich. (See Ionia, Mich.)
Ionia, Mich., Grand River. Shad, 1873.
Ionia, Mich., Maple River. California salmon, 1875.
Iowa City, Iowa, Iowa River. California salmon, 1875.
Iowa Falls, Iowa, Iowa River. California salmon, 1874.
Iowa River, Freeborn County, Minn. California salmon, 1875.
Iowa River, Iowa. California salmon, 1878, 1879.
Iowa River, Iowa City, Iowa. California salmon, 1875.
Iowa River, Iowa Falls, Iowa. California salmon, 1874.
Iowa River, Marshalltown, Iowa. Penobscot salmon, 1875.
Iowa River, Mower County, Minn. California salmon, 1875.
Iowa River, Tama City, Tama County, Iowa. Schoodic salmon, 1878.
Iowa River (upper), Decorah, Iowa. California salmon, 1875.
Iowa River, Fredericksburgh, Iowa. California salmon, 1874.
Iowa River. (See tributary: Cedar River.)
Ipswich River, Mass. California salmon, 1877.
Irish Creek, Rockbridge County, Va. Schoodic salmon, 1877.
Iron County, Mo. (See Arcadia, Mo.)
Isabella County, Mich. (See Crawford, Mich.)
Island Creek Pond, Duxbury, Mass. Schoodic salmon, 1877.
Island Lake, Dexter, Mich. Whitefish, 1876; California salmon, 1878.
Itawamba County, Miss. (See Fulton, Miss.)
Jackson City, Fairfax County, Va., Potomac River. Shad, 1873, 1875.
Jackson County, Ark. (See Newport, Ark.)
Jackson County, Iowa. (See Maquoketa, Iowa.)
Jackson County, Mich. (See Brooklyn, Mich.; Jackson, Mich.)
Jackson County, Mich., Grand River. Penobscot salmon, 1873.
Jackson County, Mich., headwaters of Kalamazoo River. Penobscot salmon, 1873.
Jackson County, Mich., tributary to Grand River. California salmon, 1873.
Jackson County, Minn., Heron Lake. California salmon, 1877.
Jackson County, Minn., lake. California salmon, 1877.
Jackson, County, Mo. (See Independence, Mo.; Kansas City, Mo.)
Jackson Lake, Rice County, Minn. Penobscot salmon, 1875.
Jackson, Mich., Crouch's Creek. California salmon, 1874.
Jackson, Mich., Crouch's Fishery. California salmon, 1874.
Jackson, Mich., Grand River. California salmon, 1876, 1879.
Jackson, Mich., east tributary of Kalamazoo River. California salmon, 1873.
Jackson, Miss., Forked Deer River. California salmon, 1876.
Jackson, Miss., Pearl River. Shad, 1875, 1876, 1879.
Jackson River, Alleghany County, Va. California salmon, 1876.
Jackson River, Clifton Forge, Va. Schoodic salmon, 1879.
Jackson, Tenn., Forked Deer River. California salmon, 1876; shad, 1876.
Jacksonville, Ill., lake. California salmon, 1877.

Jaffrey, N. H., Gilmore Pond. Schoodic salmon, 1880.
James River, Webster County, Mo. Shad, 1879.
James River, Lynchburgh, Va. California salmon, 1878.
James River, Richmond, Va. Shad, 1878.
James River, Springfield, Mo. Shad, 1877.
James River, tributary to, Botetourt County, Va. California salmon, 1874.
James River, tributary to, Rockbridge County, Va. California salmon, 1876.
James River, tributary to, Va. California salmon, 1874.
James River. (See tributaries: South tributary Nansemond River; Appomattox and Rivana Rivers; Tye, Pedlar, Jackson, North, and South Rivers; Buffalo Creek; New Reservoir, and Mountain Lake streams.)
Jamestown, N. C., Bull Run Creek. California salmon, 1878.
Jamestown, N. C., Deep River. California salmon, 1878.
Jamestown, N. C , North Fork of Deep River. California salmon, 1878.
Jasper County, Mo. (See Carthage, Mo.)
Jasper River, Warren County, Ky. California salmon, 1878.
Jefferson County, Fla., Ocilla River. Shad, 1879.
Jefferson County, Kans. (See Valley Falls, Kans.)
Jefferson County, Ky., Floyd's Fork. California salmon, 1876.
Jefferson County, N. Y., Bowell Creek. California salmon, 1878.
Jefferson County, W. Va. (See Shepherdstown, W. Va.; Harper's Ferry, W. Va.)
Jefferson County, W. Va., streams. California salmon, 1879, 1880.
Jefferson Lake, Le Sueur County, Minn. California salmon, 1878.
Jennings Pond, Davis County, Utah. California salmon, 1876, 1877.
Jennings Run, Md., Wills Creek. California salmon, 1874.
Jerome, Phelps County, Mo., Gasconade River. California salmon, 1876, 1880; shad, 1880.
Jessamine County, Ky., Hickman Creek. California salmon, 1878.
Jessamine County, Ky., Jessamine Creek. California salmon, 1878.
Jessamine Creek, Jessamine County, Ky. California salmon, 1878.
Jock's Lake, Herkimer County, N. Y. California salmon, 1874.
Joe's Pond, Danville, Vt. Schoodic salmon, 1878.
Johanna Lake, Ramsey County, Minn. California salmon, 1875, 1876, 1877; Schoodic salmon, 1875; Penobscot salmon, 1875.
Johnson County, Iowa. (See Iowa City, Iowa, Oxford, Iowa.)
Johnson Lake, Hennepin County, Minn. California salmon, 1877.
Johnsonville, Tenn., Tennessee River. Shad, 1879.
John's River, Burke County, N. C. California trout, 1880.
John's River, Morganton, N. C. California salmon, 1878, 1879.
John's River, Morganton, Burke County, N. C. Schoodic salmon, 1878.
Jonesborough, Ga., Flint River. California salmon, 1877.
Jones County, Iowa. (See Anamosa, Iowa; Monticello, Iowa.)

Jones County, N. C. (See Pollocksville, N. C.)
Jones Creek, Dover, Del. Shad, 1880.
Jones Falls. (See tributary: Stony Run.)
Jones Lake, Wayne County, Pa. Schoodic salmon, 1878.
Jones Pond, Raymond, N. H. Schoodic salmon, 1879.
Jordan Creek, Fillmore County, Minn. California salmon, 1878.
Jordan River, Jordan, Utah. California salmon, 1873, 1874, 1875, 1877; shad, 1875.
Jordan River. (See tributary: Mill Creek.)
Jordan, Salt Lake County, Utah, Jordan River. California salmon, 1873, 1874, 1875, 1877; shad, 1875.
Josephine Lake, Ramsey County, Minn. California salmon, 1876, 1876, 1877.
Juab County, Utah, Silver Creek. California salmon, 1876.
Julia Lake, Sherburne County, Minn. California salmon, 1878.
Junction City, Kans., Republican River. California salmon, 1878, 1879.
Juniata River, Blair County, Pa. California salmon, 1880.
Juniata River, Huntingdon, Pa. Penobscot salmon, 1880.
Juniata River, Newport, Pa. California salmon, 1877.
Juniata River, Tyrone, Pa. California salmon, 1879.
Juniata River. (See tributary: Trout Run.)
Kalamazoo County, Mich., Gourd Neck Lake. California salmon, 1879.
Kalamazoo County, Mich., Gull Lake. California salmon, 1873, 1875.
Kalamazoo County, Mich., Indian Lake. California salmon, 1875.
Kalamazoo County, Mich. (See Kalamazoo, Mich.; Richland, Mich.)
Kalamazoo County, Mich., Lewis Lake. California salmon, 1875.
Kalamazoo County, Mich., Long Lake. Schoodic salmon, 1876; shad, 1873.
Kalamazoo County, Mich., Lyon's Lake. California salmon, 1875.
Kalamazoo County, Mich., McMartin's Lake. California salmon, 1875.
Kalamazoo County, Mich., Portage River. California salmon, 1875.
Kalamazoo County, Mich., Putty Lake. California salmon, 1875.
Kalamazoo County, Mich. (See Richland, Mich.)
Kalamazoo, Mich., Spring Brook Creek. California salmon, 1874.
Kalamazoo County, Mich., Twin Lakes. California salmon, 1875.
Kalamazoo County, Mich., Wood's Lake. California salmon, 1875.
Kalamazoo, Mich., Baptist Seminary Pond. California salmon, 1875.
Kalamazoo, Mich., pond at Lunatic Asylum. California salmon, 1874.
Kalamazoo River, east tributary of, Jackson, Mich. California salmon, 1873.
Kalamazoo River, headwaters of, Jackson County, Mich. Penobscot salmon, 1873.
Kalamazoo River, lake tributary of, Ross, Mich. California salmon, 1873.
Kalamazoo River. (See tributaries: Gull, Goguac, Hamblin, Dumont, and Long Lakes.)

Kalkaska County, Mich., Blue Lake. California salmon, 1879.
Kalkaska County, Mich. (See Crofton, Mich.; Kalkaska, Mich.)
Kalkaska County, Mich., Log Lake. Schoodic salmon, 1876.
Kalkaska County, Mich., Rapid River. California salmon, 1876.
Kalkaska County, Mich., Torch Lake. California salmon, 1876.
Kalkaska, Mich., North Boardman River. California salmon, 1876.
Kanawha County, West Va. (See Charleston, W. Va.)
Kanawha River, Charlestown, Kanawha County, W. Va. California salmon, 1878.
Kanawha River. (See tributaries: Greenbrier River, Elk River, New River.)
Kandiyohi County, Minn., Diamond Lake. California salmon, 1877.
Kandiyohi County, Minn., Eagle Lake. California salmon, 1876, 1877, 1877.
Kandiyohi County, Minn., George Lake. California salmon, 1877.
Kandiyohi County, Minn., Green Lake. California salmon, 1876, 1877, 1877.
Kandiyohi County, Minn. (See Wilmar, Minn.)
Kane County, Ill. (See Elgin, Ill.)
Kanesiac Pond, Danbury, Conn. Schoodic salmon, 1880.
Kankakee River, Ill. California salmon, 1876, 1877, 1878.
Kankakee River, La Porte, Ind. California salmon, 1875.
Kankakee River, Michigan City, Ind. California salmon, 1876.
Kankakee River. (See tributary: Grapevine Creek.)
Kansas City, Mo., Kansas River. Shad, 1876.
Kansas River, Kansas City, Mo. Shad, 1876.
Kansas River. (See tributaries: Red Vermillion, Big Blue, Republican, Solomon, Soldier, Vermillion, and Smoky Hill Rivers; Spring, Clear, Chapman's, Wakarusa, Dragoon, and Delevan Creeks; Silver and Lyndon Lakes.)
Kaskaskia River, Belleville, Ill. California salmon, 1877.
Kaskaskia River, Farlow, Ill. Shad, 1878.
Kasota, Minn., Minnesota River. California salmon, 1877.
Keene's Lake, Calais, Me. Schoodic salmon, 1878, 1879.
Keene's Lake, Keene's Lake Stream. California salmon, 1879.
Keene's Lake Stream, Keene's Lake, Me. California salmon, 1879.
Kelly Brook, Highgate, Vt. California salmon, 1873.
Kennebago Stream, Me. Schoodic salmon, 1874.
Kennebec County, Me. (See Manchester, Me.; Waterville, Me.)
Kennebec River, Waterville, Me. Shad, 1880.
Kennebec River, Waterville, Me. Shad, 1874.
Kennedy Lake, Dakota County, Minn. California salmon, 1876, 1878.
Kenosha Lake, Danbury, Conn. Schoodic salmon, 1879.
Kensington, Ill., Calumet River. California salmon, 1874; Penobscot salmon, 1874.

Kent, Conn., Spectacle Ponds. Schoodic salmon, 1877, 1878.
Kent, Ohio, Cuyahoga River. Shad, 1872.
Kent County, Del. (See Clayton, Del.; Dover, Del.; Milford, Del.)
Kent County, Md. (See Millington, Md.)
Kent County, Mich., Church Lake. California salmon, 1876.
Kent County. (See Grand Rapids, Mich.)
Kent County, Mich., Laberton Lake. California salmon, 1876.
Kent County, Mich., Pickerel Lake. California salmon, 1876.
Kent County, Mich. (See Ross, Mich.)
Kent County, Mich., Soft Water Lake. California salmon, 1876.
Kent County, R. I. (See Warwick, R. I.)
Kenton County, Ky. (See Covington, Ky.)
Kent's Creek, Rockford, Ill. California salmon, 1877.
Kentucky River, Lexington, Ky. California salmon, 1876.
Kentucky River, Mercer County, Ky. Shad, 1878.
Kentucky River. (See tributaries: Dick's, Lane's, Cane's, and McConnell's Rivers; White Oak, Otter, Silver, Hanging Fork, Dunlap's Branch, Lulbegrud, Howard's Upper, Howard's Lower, Big Spring Branch, Thomas Spring Branch, Saunder's Spring Branch, Hickman, Jessamine, and Elkhorn Creeks.)
Kerr's Creek Bridge, Rockbridge County, Va., North River. California salmon, 1878, 1879.
Keshena, Wis., lakes. Whitefish, 1875, 1876.
Kettle Creek, Westport, Pa. California salmon, 1878.
Kettle Pond, Washington County, Vt. Schoodic salmon, 1876.
Kettle River. (See tributaries: Moose, Bear, Cub, Moose Horn, Chubb, and Hanging Horn Lakes.
Keyser, W. Va., Potomac River. California salmon, 1876, 1878, 1880.
Kimball Lake, Stearns County, Minn. California salmon, 1877, 1878.
Kingman, Me., Mattawamkeag River. Penobscot salmon, 1875, 1876.
King's County, N. Y. (See Brooklyn, N. Y.)
Kingsley Creek, Fillmore County, Minn. California salmon, 1878.
Kingsley Lake, Ramsey County, Minn. California salmon, 1876.
Kingston, R. I., Warden's Pond. Schoodic salmon, 1878.
Kinniconick Creek, Vanceburgh, Ky. Schoodic salmon, 1878.
Kipmuck Pond, Milford, Mass. Schoodic salmon, 1879.
Knapp's Creek, Burritt, Winnebago County, Ill. California salmon, 1877.
Knob Creek, Bullitt County, Ky. California salmon, 1877.
Knox County, Ohio. (See Mount Vernon, Ohio.)
Knox County, Tenn. (See Knoxville, Tenn.)
Knoxville, Tenn., Holston River. Shad, 1875, 1876, 1879.
Korom's Lake, Minn. California salmon, 1877, 1879.
Kosciusko, Miss., Pearl River. California salmon, 1876.
Krameroth Pond, Ramsey County, Minn. California salmon, 1878.

Labar's Pond, Wis. California salmon, 1879.
Laberton Lake, Kent County, Mich. California salmon, 1876.
Lackawanna County, Pa. (See Scranton, Pa.)
La Crosse River, Sparta, Wis. California salmon, 1879.
La Cygne, Kans., Marais des Cygnes River. Shad, 1879.
La Fayette County, Miss. (See Abbeville, Miss.)
La Fayette County, Miss., Tallahatchie River. Shad, 1878, 1879.
La Fayette County, Miss., Yocana River. Shad, 1879.
La Fayette County, Wis., streams. California salmon, 1874.
La Fayette, Ind., Wabash River. Shad, 1880.
Laguna Honda, San Francisco, Cal. Schoodic salmon, 1878.
Lake City, Minn., Mississippi River. California salmon, 1877.
Lake County, Cal., Clear Lake. Whitefish, 1872, 1873.
Lake County, Ill. (See Sand Lake, Ill.)
Lake County, Mich., Big Star Lake. California salmon, 1876.
Lakeland, Washington County, Minn. California salmon, 1876.
Lake of the Woods, Branch County, Mich. California salmon, 1875.
Lake Park, Minn., lake. California salmon, 1880.
Lake Spring, Salem, Va. Schoodic salmon, 1880.
Lakeville, Conn., Wanonscoponus Lake. Schoodic salmon, 1876, 1877, 1879.
Lambertville, N. J. (See Point Pleasant, Pa.)
Lamine River, Morgan County, Mo. California salmon, 1880.
Lamoille River, Vt. Penobscot salmon, 1873.
Lamoille River, Georgia, Vt. Penobscot salmon, 1874; shad, 1874, 1875.
Lancaster County, Pa. (See Chickies, Pa.; Columbia, Pa.; Lancaster, Pa.; Marietta, Pa.; Salisbury, Pa.)
Lancaster County, Pa., Chiquesalunga Creek. California salmon, 1875, 1877; Penobscot salmon, 1874.
Lancaster County, Pa., Donegal Run. Schoodic salmon, 1880.
Lancaster, Mass., Nashua River. California salmon, 1876; Penobscot salmon, 1876.
Lancaster, Mass., ponds. Schoodic salmon, 1876, 1877.
Lanesborough, Minn., tributary of Root River. California salmon, 1876.
Lane's Run, Scott County, Ky. California salmon, 1876.
Lansing, Mich., Grand River. Shad, 1873.
La Porte County, Ind. (See La Porte, Ind.; Michigan City, Ind.)
La Porte, Ind., Kankakee River. California salmon, 1875.
La Porte, Ind., Stony Lake. Schoodic salmon, 1880.
Larned, Kans., Pawnee Creek. California salmon, 1878, 1879, 1880; shad, 1879.
Lassen County, Cal., Eagle Lake. Whitefish, 1879.
La Sueur County. (See Kasota, Minn.)
Lauderdale County, Miss. (See Meridian, Miss.)
Laura Lake, Blue Earth County, Minn. California salmon, 1876.

Laurel County, Ky., White Oak Branch. California salmon, 1877.
Laurel, Md., Patuxent River. California salmon, 1875, 1876, 1878, 1879; shad, 1877, 1878, 1879, 1880.
Lawrence County, Mo. (See Pierce City, Mo.)
Lawrence, Mass., ponds. Schoodic salmon, 1878.
Lead Mines, Wythe County, Va., New River. Schoodic salmon, 1880.
Leavenworth County, Kans. (See Delaware, Kans.; Stranger, Kans.)
Lebanon, Ala., Big Wills Creek. Shad, 1879.
Le Bœuf Creek, Erie County, Pa. Schoodic salmon, 1880.
Le Mars, Iowa, Floyd River. California salmon, 1875.
Lemonweir River, Tomah, Wis. California salmon, 1879.
Lemonweir River, Tunnel City, Wis. California salmon, 1879.
Lenawee County, Mich. (See Palmyra, Mich.; Raisin Centre, Mich.; Woodstock, Mich.)
Lenawee County, Mich., tributaries of Raisin River. California salmon, 1875.
Le Roy, Mich., Rose Lake. Whitefish, 1876.
Le Sueur County, Minn., Lake Emily. California salmon, 1876, 1877, 1878.
Le Sueur County, Minn., Lake Jefferson. California salmon, 1878.
Le Sueur County, Minn., Lake Letook. California salmon, 1879.
Le Sueur County, Minn., Lake Takota. California salmon, 1879.
Le Sueur County, Minn., Lake Washington. California salmon, 1878.
Letook Lake, Le Sueur County, Minn. California salmon, 1879.
Lewisburgh, Green Brier County, W. Va., Sinking Creek. California salmon, 1878.
Lewisburgh, Pa., Buffalo Creek. California salmon, 1879.
Lewis County, Ky. (See Vanceburgh, Ky.)
Lewis County, W. Va. (See Walkersville, W. Va.; Weston, W. Va.)
Lewis Creek, Fernsburgh, Vt. Penobscot salmon, 1875.
Lewis Lake, Kalamazoo County, Mich. California salmon, 1875.
Lexington, Va., Buffalo Creek. Schoodic salmon, 1879.
Lexington, Ky., Kentucky River. California salmon, 1876.
Lexington, Mo., Missouri River. California salmon, 1880.
Lexington, Va., McKee's Spring. Schoodic salmon, 1879.
Lexington, Va., North River. California salmon, 1877, 1878; Schoodic salmon, 1879.
Lexington, Va., South River. Schoodic salmon, 1879; California salmon, 1878, 1880.
Liberty Grove, Md., Octorora Creek. California salmon, 1874, 1878.
Liberty, N. Y., Cohocton River. California salmon, 1873.
Licking County, Ohio, Licking Reservoir. California salmon, 1879.
Licking Reservoir, Licking County, Ohio. California salmon, 1879.
Licking River, Mount Sterling, Ky. Shad, 1877.
Licking River. (See tributary: Strodes Creek.)
Lilly Pond, Foster, R. I. Schoodic salmon, 1876.

Limepang Lake, Guilford, Conn. Schoodic salmon, 1880.
Limerick Lake, Aroostook County, Me. Schoodic salmon, 1878.
Lincoln County, Ky., Dick's River. California salmon, 1876.
Lincoln County, Ky., Hanging Fork. California salmon, 1876.
Lincoln County, Ky. (See McKinney's Station, Ky.)
Lincoln County, Me. (See Damariscotta, Me.)
Lincoln, Mass., Sandy Pond. Schoodic salmon, 1876, 1877.
Linden, Mich., Cook's Lake. Whitefish, 1876.
Linden, Mich., Day Lake. Whitefish, 1876.
Linden, Mich., Round Lake. Whitefish, 1876.
Linden, Mich., Silver Lake. Whitefish, 1876.
Linkwood, Md., Transquaking River. California salmon, 1879.
Linn County, Iowa. (See Cedar Rapids, Iowa; Marion, Iowa; Springville, Iowa; Walker, Iowa.)
Linn County, Kans. (See La Cygne, Kans.)
Linsey's Creek, Grant County, W. Va. California salmon, 1879, 1880.
Linville River, Bridgewater, N. C. California salmon, 1878, 1879.
Linville River, Morganton, N. C. California salmon, 1879.
Linville River, Morganton, Burke County, N. C. Schoodic salmon, 1878.
Lisborn River, Iowa. California salmon, 1879.
Litchfield, Conn., Bantam Lake. Schoodic salmon, 1876, 1877, 1878, 1879.
Litchfield County, Conn. (See Chapinville, Conn.; Colebrook, Conn.; Falls Village, Conn.; Kent, Conn.; Lakeville, Conn.; Litchfield, Conn.; New Hartford, Conn.; New Milford, Conn.; New Preston, Conn.; Norfolk, Conn.; Pine Meadow, Conn.; Salisbury, Conn.; South Kent, Conn.; Warren, Conn.; West Winsted, Conn.; Winsted, Conn.; Woodbury, Conn.)
Litchfield, Meeker County, Minn. Penobscot salmon, 1875; Schoodic salmon, 1875.
Little Arkansas River, Halstead, Kans. California salmon, 1878, 1879.
Little Arkansas River. (See tributary: Lake Inman.)
Little Blue River, Waterville, Kans. California salmon, 1878, 1879.
Little Butts Lake, Ramsey County, Minn. California salmon, 1876.
Little Elk River, Rock Church, Md. California salmon, 1878.
Little Falls of the Potomac River, Georgetown, D. C. Shad, 1879, 1880.
Little Gunpowder River, Monkton, Md. California salmon, 1876, 1876, 1877, 1878.
Little Hinkston Creek, Montgomery County, Ky. California salmon, 1877.
Little Iowa, Mower County, Minn. California salmon, 1878.
Little Kanawha River, Erwingsville, W. Va. California salmon, 1878.
Little Kentucky, East and West forks of, Henry County, Ky. California salmon, 1876.
Little Lorrim, Boyd's, Md. California salmon, 1878.

Little Maquoketa River, Epworth, Iowa. California salmon, 1874.
Little Maquoketa River, Farley, Iowa. California salmon, 1874.
Little Miami River, Sidney, Ohio. California salmon, 1875.
Little Nanticoke River, Seaford, Del. California salmon, 1880.
Little Patuxent River, Patuxent, Md. California salmon, 1875.
Little Patuxent River, Mount Airy, Md. California salmon, 1879.
Little Patuxent River, Savage, Md. California salmon, 1875, 1876, 1876, 1876.
Little Pedee, Nichols, S. C. Shad, 1880.
Little Pipe Creek, Westminster, Md. Schoodic salmon, 1879.
Little Red River, White County, Ark. Shad, 1879.
Little River, Christian County, Ky. California salmon, 1878.
Little River, Halstead, Kans. Shad, 1879.
Little River, Ousley, Ga. Shad, 1879.
Little River, S. C. California salmon, 1880.
Little River, Taylorsville, Va. Shad, 1878.
Little River, Trigg County, Ky. California salmon, 1877.
Little Rock, Ark., Arkansas River. California salmon, 1878.
Little Sandy River, Carter County, Ky. California salmon, 1878.
Little Sioux River, Cherokee, Iowa. California salmon, 1875.
Little Thala Pond, Dutchess County, N. Y. Schoodic salmon, 1879.
Littleton, Wetzel County, W.Va., Fish Creek. California salmon, 1877, 1878.
Littleton, W. Va., Fish Creek. California salmon, 1879, 1880; Schoodic salmon, 1879.
Little Youghiogheny River, Deer Park, Md. Shad, 1880.
Little Youghiogheny River, Oakland, Md. Schoodic salmon, 1880.
Livermore Falls, N. H., Pemigewasset River. Penobscot salmon, 1876.
Livingston County, Mich. (See Putnam, Mich.)
Livingston County, N. Y. (See Caledonia, N. Y.)
Livingston County, N. Y., Conesus Lake. California salmon, 1875.
Livingston County, N. Y., Genesee River. California salmon, 1875.
Livingston County, N. Y., Spring Creek. California salmon, 1879, 1879.
Lockville, N. C., Cape Fear River. Shad, 1878.
Lodi, Wis., Spring Creek. California salmon, 1878.
Logan County, Ohio. (See Bellefontaine, Ohio.)
Logan, Iowa, Boyer River. Shad, 1878.
Logansport, Ind., Wabash River. Shad, 1873, 1874.
Log Lake, Kalkaska County, Mich. Schoodic salmon, 1876.
Long Green, Md., branch of Gunpowder River. California trout, 1880.
Long Green, Md., pond tributary to Little Gunpowder River. Schoodic salmon, 1880.
Long Island, N. Y., Conetquoit River. California salmon, 1876, 1877.
Long Island, N. Y., Gnat River. California salmon, 1876, 1877.
Long Island Sound, N. Y., small tributaries. Penobscot salmon, 1873.

Long Island Sound, tributary of, Queens County, N. Y. California salmon, 1874.
Long Lake, Barry County, Mich. California salmon, 1875.
Long Lake, Kalamazoo County, Mich. Schoodic salmon, 1876; shad, 1873.
Long Lake, Minn. California salmon, 1877.
Long Lake, Minnetonka, Minn. California salmon, 1877.
Long Lake, Richland, Mich. California salmon, 1878.
Long Lake, Watonwan County, Minn. Schoodic salmon, 1879.
Long Lake, West Winsted, Conn. Schoodic salmon, 1878, 1879.
Long Lake, Winsted, Conn. Schoodic salmon, 1876, 1877.
Long Pond, Benton, N. H. Schoodic salmon, 1880.
Long Pond, Dutchess County, N. Y. Schoodic salmon, 1879.
Loon Lake, Blue Earth County, Minn. California salmon, 1876, 1877.
Loon Lake, Crofton, Mich. Whitefish, 1876.
Lorain County, Ohio. (See Elyria, Ohio.)
Lord's Lake, Pontiac, Mich. California salmon, 1876; Penobscot salmon, 1873.
Lorewell's Pond, Wakefield, N. H. California salmon, 1879.
Lower Bear River. (See tributary: Blacksmith's Fork.)
Lowe Lake, Chelsea, Mich. Whitefish, 1876.
Lowndes County, Ga. (See Ousley, Ga.)
Lucas County, Ohio. (See South Toledo, Ohio.)
Lucas County, Ohio. (See Toledo, Ohio; Waterville, Ohio.)
Lulbregrud Creek, Clark County, Ky. California salmon, 1876.
Luling, Tex., San Marcus River. Shad, 1879.
Lunatic Asylum Pond, Kalamazoo, Mich. California salmon, 1874.
Lunenburgh, Mass., Unkechewaton Pond. Schoodic salmon, 1876, 1877.
Luzerne County, Pa., Beaver Lake. Schoodic salmon, 1880.
Luzerne County, Pa., Beaver Lake. Schoodic salmon, 1878.
Luzerne County, Pa. (See Dallas, Pa.; Hazleton, Pa.; White Haven, Pa.; Wilkes Barre, Pa.)
Lycoming, Pa. (See Ralston, Pa.; Williamsport, Pa.)
Lydard Lake, Hennepin County, Minn. California salmon, 1878.
Lyme, Conn., Hog Lake. Schoodic Lake, 1877, 1878, 1879.
Lyme, Conn., Roger's Lake. Schoodic salmon, 1876, 1880.
Lynchburgh, Va., James River. California salmon, 1878.
Lynch's Creek, Sumter County, S. C. Shad, 1880.
Lyndon Lake, Burlingame, Kans. California salmon, 1880.
Lynnfield, Mass., Suntaug Lake. Schoodic salmon, 1879.
Lynn, Mass, Flax Pond. Schoodic salmon, 1878.
Lynn, Mass., Spring Pond. Schoodic salmon, 1878.
Lyon County, Kans. (See Emporia, Kans.; Reading, Kans.)
Lyon Lake, Calhoun County, Mich. California salmon, 1879.
Lyon's Lake, Kalamazoo County, Mich. California salmon, 1875.

McCann's Lake, Ramsey County, Minn. California salmon, 1876, 1877; Schoodic salmon, 1878.
McCarthy's Lake, Stevens County, Minn. California salmon, 1877.
McCloud River, Baird, Cal. California salmon, 1873, 1874, 1875, 1876, 1877, 1878, 1879, 1880.
McConnel's Run, Scott County, Ky. California salmon, 1876.
McDonald's Run, Norrisville, Md. California trout, 1880.
McDowell County, N. C., Mill Creek. California trout, 1880.
McDowell County, N. C. (See Marion, N. C.; Old Fort, N. C.)
McGrath's Lake, Dakota County, Minn. California salmon, 1878.
McGregor, Iowa, Bloody Run. California salmon, 1874.
McHenry, Ill., Column Lake. California salmon, 1877.
McHenry County, Ill. (See Crystal Lake, Ill.; McHenry, Ill.; Richmond, Ill.; Cary Station, Ill.)
McIndoe's Falls, Vt., Connecticut River. Penobscot salmon, 1874.
McKee's Spring, Lexington, Va. Schoodic salmon, 1879.
McKinney's Station, Ky., Green River. Shad, 1878.
McKusic's Lake, Washington County, Minn. California salmon, 1876, 1877.
McKinsie Lake, Minn. California salmon, 1877.
McLeod County, Minn., Morrison Lake. California salmon, 1876.
McMartin's Lake, Kalamazoo County, Mich. California salmon, 1875.
McMinn County, Tenn. (See Athens, Tenn.)
Macomb County, Mich. (See Romeo, Mich.)
Macomb County, Mich. (See Utica, Mich.)
Macon, Ga., Ocmulgee River. California salmon, 1878; shad, 1876, 1877, 1878, 1879.
Macon County, Ga. (See Montezuma, Ga.)
Macon County, Mo., Chariton River. Shad, 1880.
Macon County, Mo. (See Callao, Mo.)
McPherson, Kans., Lake Inman. California salmon, 1878, 1879.
McPherson County, Kans., Inman Lake. Schoodic salmon, 1879.
McPherson County, Kans. (See McPherson, Kans.)
Madaceunk Stream, Me. Penobscot salmon, 1875.
Madelia Lake, Watonwan County, Minn. California salmon, 1876.
Madelia, Minn., tributaries of Watonwan River. California salmon, 1877.
Madison County, La., Roundaway Creek. Shad, 1879.
Madison County, La., Tensas River. Shad, 1879.
Madison County, Miss. (See Canton, Miss.)
Madison County, Tenn. (See Jackson, Tenn.)
Madison Lake, Blue Earth County, Minn. California salmon, 1876, 1877.
Madison Lake, Wis. Penobscot salmon, 1874.
Madison, N. H., Silver Lake. Schoodic salmon, 1878.
Madison, Wis., creek. California salmon, 1878.

Madison, Wis., Lake Mendota. California salmon, 1877.
Madison, Wis., pond. California salmon, 1877.
Madison County, Ky., Otter Creek. California salmon, 1876.
Madison County, Ky., Silver Creek. California salmon, 1876.
Magnolia, Md., Winter's Run. California salmon, 1876.
Magog Lake, Acton, Mass. Schoodic salmon, 1879.
Mahantonga River, Pa. California salmon, 1874.
Mahantonga River, Upper Paxton, Pa. California salmon, 1873.
Mahkunac Lake, Stockbridge, Mass. Schoodic salmon, 1878, 1879, 1880.
Maiden Run, Pa. California salmon, 1876.
Main River, Conn. Penobscot salmon, 1873.
Main River, North Branford, Conn. Penobscot salmon, 1873.
Mallory Lake, Woodstock, Mich. California salmon, 1878.
Manchester, Iowa, Maquoketa River. California salmon, 1875; Penobscot salmon, 1875.
Manchester, Me., Cobosecontee Lake. Schoodic salmon, 1879.
Manchester, N. H., Nutt's Pond. Schoodic salmon, 1879.
Manchester, N. H., Wassabesic Lake. Schoodic salmon, 1879.
Manchester, Vt., Battenkill Creek. Penobscot salmon.
Manhattan, Kans., Big Blue River. California salmon, 1878, 1879, 1880.
Manhattan, Kans., Blue River. 1879.
Manistee River, Mich. Penobscot salmon, 1873.
Manistee River, Wexford County, Mich. California salmon, 1879.
Manistee River. (See tributary: Pine River.)
Mankato, Minn. Penobscot salmon, 1875.
Mannington, W. Va., Fishing Creek. California salmon, 1878.
Manokin River, Princess Anne, Md. Shad, 1878, 1879.
Mantor Brook, Dodge County, Minn. California salmon, 1878.
Mantua Creek, Glassborough, N. J. California salmon, 1876, 1877, 1878.
Mantua River, Wenonah, N. J. California salmon, 1877.
Maple River, Ionia, Mich. California salmon, 1875.
Maple River, Iowa. California salmon, 1879.
Maple River. (See tributary: Elysian Lake.)
Maquoketa, Iowa, Maquoketa River. California salmon, 1874.
Maquoketa River, Iowa. California salmon, 1879.
Maquoketa River, Charlotte, Iowa. California salmon, 1874.
Maquoketa River, Delaware, Iowa. California salmon, 1875.
Maquoketa River, Delhi, Iowa. California salmon, 1875.
Maquoketa River, Hopkinton, Iowa. California salmon, 1875.
Maquoketa River, Manchester, Iowa. California salmon, 1874, 1875; Penobscot salmon, 1875.
Maquoketa River, Monticello, Iowa. California salmon, 1874.
Maquoketa River, Worthington, Iowa. California salmon, 1875.

Marais des Cygnes River, La Cygne, Kans. Shad, 1879.
Marais des Cygnes River, Reading, Kans. California salmon, 1880; shad, 1879.
Marengo County, Ala. (See Demopolis, Ala.)
Marietta, Pa., Susquehanna River. California salmon, 1875, 1877, 1880.
Marine Lake, Washington County, Minn. California salmon, 1876.
Marion County, Ind. (See Indianapolis, Ind.)
Marion County, Kans. (See Florence, Kans.)
Marion County, Ky., north and east fork of Rolling Fork. California salmon, 1877.
Marion County, S. C., Great Pee Dee River. Shad, 1878, 1880.
Marion County, S. C. (See Nichols, S. C.)
Marion County, W. Va., Buffalo Creek. Schoodic salmon, 1878.
Marion County, W. Va., branch of Buffalo Creek. Schoodic salmon, 1878.
Marion County, W. Va., Dent's River. Schoodic salmon, 1878.
Marion County, W. Va., Meadow Run. Schoodic salmon, 1879.
Marion County, W. Va., Prichard's Run. Schoodic salmon, 1878.
Marion County, W. Va., streams. California salmon, 1879, 1880.
Marion County, W. Va. (See Mannington, W. Va.)
Marion, Ill., Mississinewa River. Shad, 1878.
Marion, Iowa, Cedar River. California salmon, 1874.
Marion Lake, Iowa. Penobscot salmon, 1876.
Marion, N. C., Broad River. California salmon, 1877.
Mark West Creek, Sonoma County, Cal. Whitefish, 1879.
Marquette County, Mich., Michigamme Lake. California salmon, 1876.
Marquette County, Mich., Three Lakes. California salmon, 1876.
Marquette County, Mich. (See Negaunee, Mich.)
Marshall County, Iowa. (See Marshalltown, Iowa.)
Marshall County, Kans. (See Barrett, Kans.; Blue Rapids, Kans.; Frankfort, Kans.; and Waterville, Kans.)
Marshall County, Mich., Reed's Pond. Schoodic salmon, 1876.
Marshall County, Miss. (See Holly Springs, Miss.)
Marshall County, W. Va. (See Bellton, W. Va.)
Marshall, Mich., lake near. Penobscot salmon, 1873.
Marshalltown, Iowa., Iowa River. Penobscot salmon, 1875.
Marshfield, Mass., North River. California salmon, 1876, 1877.
Marston Branch, Dodge County, Minn. California salmon, 1878.
Martin County, Minn., Cedar Lake. Schoodic salmon, 1879.
Martin County, Minn., Chain Lake. California salmon, 1879.
Martin's Creek, S. C. California salmon, 1880.
Mary's Lake, Mower County, Minn. California salmon, 1879.
Mary's Lake, Minn. California salmon, 1877.
Mary's Pond, Rochester, Mass. Schoodic salmon, 1879, 1880.
Mascoma Lake, Enfield, N. H. Schoodic salmon, 1879.
Mashpee, Mass., Crystal Lake. Schoodic salmon, 1879.

Massabesic Lake, Manchester, N. H. Schoodic salmon, 1879.
Mattapony River, Milford, Va. Shad, 1878, 1878.
Mattawamkeag, Me., Mattawamkeag River. Shad, 1873, 1874, 1874, 1875.
Mattawamkeag, Me., Penobscot River. Shad, 1880.
Mattawamkeag River, Bancroft, Me. Penobscot salmon, 1875, 1876.
Mattawamkeag River, Eaton, Me. Penobscot salmon, 1874.
Mattawamkeag River, Danforth, Me. Penobscot salmon, 1874.
Mattawamkeag River, Kingman, Me. Penobscot salmon, 1876.
Mattawamkeag River, Mattawamkeag, Me. Shad, 1873, 1874, 1874, 1875.
Maumee Rapids, Ohio. Schoodic salmon, 1876.
Maumee Rapids, Toledo, Ohio. California salmon, 1878.
Maumee River, Defiance, Ohio. California salmon, 1878.
Maumee River, Ohio. California salmon, 1877.
Maumee River, South Toledo, Ohio. California salmon, 1877.
Maumee River, Toledo, Ohio. Penobscot salmon, 1875; Schoodic salmon, 1878, 1879.
Maumee River, Waterville, Ohio. California salmon, 1880.
Maumee River. (See tributary: Tiffin River.)
Maurepas Lake. (See tributary: Notalbany River.)
Maurice River, Cumberland County, N. J. California salmon, 1879.
Maurice River, N. J. California salmon, 1877, 1878.
Maurice River, Vineland, N. J. California salmon, 1876.
Maynard, Iowa, Turkey River. California salmon, 1875.
Mayo River, Rockingham County, N. C. Schoodic salmon, 1878.
May's Landing, N. J., Great Egg Harbor River. California salmon, 1876.
Mazeppa Creek, Mazeppa, Minn. California salmon, 1876.
Mazeppa, Minn., Mazeppa Creek. California salmon, 1876.
Mazeppa, Minn., Zumbro River. California salmon, 1878.
Meade County, Ky., Doe Run. California salmon, 1877.
Meadow's Run, Marion County, W. Va. Schoodic salmon, 1879.
Mechanicsburgh, Pa., Yellow Breeches Creek. California salmon, 1873.
Mechanicstown, Md., Owen's Creek. California salmon, 1874, 1878, 1879.
Mecklenburgh County, N. C. (See Charlotte, N. C.)
Medford, Mass., Mystic Lake. Schoodic salmon, 1877, 1880.
Medford, Mass., Wedge Pond. Schoodic salmon, 1877, 1880.
Medicine Lake, Minn. California salmon, 1877.
Meeker County, Minn., Litchfield. Penobscot salmon, 1875; Schoodic salmon, 1875.
Meeker County, Minn. (See Litchfield, Minn.)
Meherrin River, Branchville, N. C. Shad, 1878, 1879.
Melrose, Conn., Melrose Pond. Schoodic salmon, 1879.
Melrose, Mass., ponds. Schoodic salmon, 1880.
Melrose Pond, Melrose, Conn. Schoodic salmon, 1879.

Memphis, Tenn., Wolf River. California salmon, 1875.
Mendenhall Creek, Mich. California salmon, 1875.
Mendon, Mass., Nipmug Pond. Schoodic salmon, 1876, 1879, 1880.
Mendota Lake, Dane County, Wis. California salmon, 1877.
Mendota Lake, Madison, Wis. California salmon, 1877.
Menomonee Lake, Mich. California salmon, 1876.
Menomonee River, Wis. Penobscot salmon, 1873.
Menomonee River. (See tributaries: Michigamme Lake, Three Lakes, Nagawicka Lake.)
Meramec River, Franklin, Mo. California salmon, 1878, 1879; shad, 1879.
Meramec River, Pacific, Mo. California salmon, 1876; shad, 1876.
Mercer County, Ky., Kentucky River. Shad, 1878.
Mercer County, Ky., small streams. California salmon, 1876.
Meriden, Conn., Black Pond. Schoodic salmon, 1880.
Meridian, Miss., Chickasawhatchie River. California salmon, 1876.
Meridian, Miss., Chunky River. Shad, 1879.
Meridian, Miss., Okatibee Creek. Shad, 1878.
Meris de Cygnes River. (See Marais des Cygnes.)
Merrimack County, N. H. (See Boscawen, N. H.; Bradford, N. H.; Contoocook, N. H.; Epsom, N. H.; Franklin, N. H.; Newbury, N. H.; Northfield, N. H.; Pittsfield, N. H.; Warner, N. H.)
Merrimack River, headwaters of, Woodstock, N. H. California salmon, 1877; Penobscot salmon, 1873.
Merrimack River, tributary of, Campton, N. H. Penobscot salmon.
Merrimack River, tributury of, Mass. Penobscot salmon, 1873.
Merrimack River, tributary of, Plymouth, N. H. Penobscot salmon, 1873.
Merrimack River, tributary of, Thornton, N. H. Penobscot salmon, 1873.
Merrimack River, tributary of, W. Campton, N. H. Penobscot salmon, 1873.
Merrimack River. (See tributaries: Nassau River, Pemigewasset, Bakers, and Contoocook Rivers, Winnipesaukee and Contoocook Rivers.)
Merry-meeting Lake, New Durham, N. H. Schoodic salmon, 1878, 1879.
Metcalf Lake, Calhoun County, Mich. California salmon, 1874, 1875; Schoodic salmon, 1878.
Mexican Dam, Carson City, Nev. California salmon, 1869.
Mexico, Mo., Salt Creek. Shad, 1877.
Miami River, Dayton, Ohio. California salmon, 1879.
Mianus, Conn., Mianus River. Schoodic salmon, 1880.
Mianus River, Mianus, Conn. Schoodic salmon, 1880.
Michigamee Lake, Marquette County, Mich. California salmon, 1876.
Michigan City, Ind., Kankakee River. California salmon, 1876.

Michigan Lake, Buffalo, Mich. Whitefish, 1876.

Michigan Lake. (See tributaries: Calumet River, Elkhart River, Kankakee River; Boyree, Saint Joseph, Grand, and Manistee Rivers; Bear Creek, Pine Creek; Ground Neck, Minckler, Wetmore, Sixteen, Crystal, Round, Lyons, Woods, McMartin's, Lewis, Metcalf, Carter, Twin, Putty, Pine, Menomonee, Miner, Big Paw Paw, Barrow, Wallow, and Sister Lakes; Brown's Lake, Fox River; Menomonee, Oconomowoc, and Milwaukee Rivers.)

Middleborough, Mass., Assawampsett Lake. Schoodic salmon, 1877, 1878, 1879.

Middleborough, Mass., Taunton River. Shad, 1876, 1877.

Middle Branch, Fillmore County, Minn. California salmon, 1878.

Middleburgh, Md., Big Pipe Creek. California salmon, 1879.

Middlebury, Conn., Quaspaugh Lake. Schoodic salmon, 1880.

Middle Creek, Hardin County, Ky. California salmon, 1876.

Middle Fork of Forked Deer River, Humboldt, Tenn. Shad, 1878.

Middle Island Creek, West Union, W. Va. California salmon, 1877, 1878.

Middle Patuxent River, Savage, Md. California salmon, 1879.

Middle River, Iowa. California salmon, 1879.

Middle River, Staunton, Va. Schoodic salmon, 1879.

Middlesex County, Conn. (See Durham, Conn.; East Hampton, Conn.; Higganum, Conn.)

Middlesex County, Mass. (See Acton, Mass.; Billerica, Mass.; Farmingham, Mass.; Greenwood, Mass.; Groton, Mass.; Holliston, Mass.; Lincoln, Mass.; Medford, Mass.; Melrose, Mass.; Natick, Mass.; Newton, Mass.; Stoneham, Mass.; Wakefield, Mass.; Waltham, Mass.; Winchester, Mass.)

Middleton, Mass., Middleton Pond. Schoodic salmon, 1877.

Middleton Pond, Middleton, Mass. Schoodic salmon, 1877.

Middletown, Md., Sassafras River. Shad, 1879.

Middletown, Md., stream. California salmon, 1878.

Middletown, Md., Bohemia River. Shad, 1879.

Midland County, Mich. (See Midland, Mich.)

Midland, Mich., Chippewa River. California salmon, 1875.

Midland Mich., Tittabawassee River. California salmon, 1875.

Midway, Fla., Ockolockone River. Shad, 1879.

Mifflinburgh, Pa., Penn Creek. California salmon, 1879.

Miles Creek, Cordova Station, Md. Shad, 1879.

Miles Creek, pond tributary to Easton, Md. Schoodic salmon, 1879.

Miles Creek. (See tributary: Wye Mills.)

Miles River, Easton, Md. Shad, 1878.

Milford, Del., Mispillion Creek. Shad, 1879.

Milford, Mass., Kipmuck Pond. Schoodic salmon, 1879.

Milford, Va., Mattapony River. Shad, 1878, 1878.

Millbrook, Ohio, Muskingum River. California salmon, 1873.

Millbury, Mass., ponds. Schoodic salmon, 1880.
Mill Creek, Hamatts' Mill, W. Va. Schoodic salmon, 1879, 1879.
Mill Creek, Hampshire County, W. Va. Schoodic salmon, 1878.
Mill Creek, McDowell County, N. C. California trout, 1880.
Mill Creek, S. C., California trout, 1880. Schoodic salmon, 1880.
Mill Creek, Utah County, Utah. California salmon, 1877.
Mill Creek, Washington, Kans. California salmon, 1878, 1879.
Mill Dam, Clear Spring, Md. Schoodic salmon, 1880.
Milledgeville, Ga., Ocone River. California salmon, 1878; shad, 1876, 1877, 1880.
Miller Creek, Cass County, Mich. California salmon, 1878.
Millington, Md., Andover Branch. California salmon, 1879.
Millington, Md., Chester River. California salmon, 1876, 1877, 1879, 1880; shad, 1878, 1879.
Mill River, North Branford, Conn. California salmon, 1874.
Mill River, Southport, Conn. Penobscot salmon, 1875, 1877.
Mill Run, Romney, W. Va. California trout, 1880.
Mill Stream, Van Buren County, Mich. California salmon, 1879.
Milo, Me., Piscataquis River. Penobscot salmon, 1874.
Milton, Mass., Houghton's Pond. Schoodic salmon, 1878, 1879.
Milton, N. H., Tri-Echo Lake. California salmon, 1879.
Milwaukee County, Wis., Wauwatosa, Wis.
Milwaukee River, Wauwatosa, Wis. Penobscot salmon, 1873.
Milwaukee River. (See tributary: Cedar Creek.)
Minckler Lake, Allegan County, Mich. California salmon, 1879.
Mineola, Tex., Sabine River. Shad, 1879.
Mineral County, W. Va., streams. California salmon, 1879, 1880.
Mineral County, W. Va. (See Keyser, W. Va.; Piedmont, W. Va.)
Minneapolis, Minn., stream. California salmon, 1880.
Minnebelle Lake, Meeker County, Minn. California salmon, 1877.
Minnesota Lake, Faribault County, Minn. California salmon, 1875, 1876.
Minnesota River, Blue Earth County. California salmon, 1878.
Minnesota River, Faribault County, Minn. California salmon, 1875.
Minnesota River, Kasota, Minn, California salmon, 1877.
Minnesota River, Rice County, Minn. California salmon, 1875.
Minnesota River, Saint Peter, Minn. Penobscot salmon, 1875.
Minnesota River. (See tributaries: Eagle, Elysian, Loon, Clear, Saint Mary's, McCarthy's, Bois des Sioux, Forks of Otter Tail, Madison, Hausca, Gavins, Frog, Donnelly, Cedar, Alley, Preston, Letook, Takota Lakes, Watonwan, Pomme de Terre, Chippewa Rivers, Goose Creek, Saint Peter, Mankato.)
Minnetonka Lake, Hennepin County, Minn. California salmon, 1878; Penobscot salmon, 1875; Schoodic salmon, 1875.
Minnetonka Lake, Hennepin County, Minn. California salmon, 1875, 1876.

Minnetonka Lake, Minn., Long Lake. California salmon, 1877.
Minnewasta Lake, Carver County, Minn. California salmon, 1878.
Minor Lake, Allegan County, Mich. California salmon, 1878, 1879.
Mispillion Creek, Milford, Del. Shad, 1879.
Missisquoi River, Highgate, Vt. California salmon, 1873.
Missisquoi River, Swanton, Vt. California salmon, 1873; shad, 1874.
Mississinewa River, Marion, Ill. Shad, 1878.
Mississippi River, Belleville, Ill. California salmon, 1877.
Mississippi River, Lake City, Minn. California salmon, 1877.
Mississippi River, Red Wing, Minn. California salmon, 1876.
Mississippi River, Saint Louis, Mo. Shad, 1877, 1878.
Mississippi River, Saint Paul, Minn. Shad, 1872, 1874, 1877.
Mississippi River, tributary of, Avon Station, Minn. California salmon, 1877.
Mississippi River, tributary of, Clinton Junction, Iowa. California salmon, 1874.
Mississippi River, tributary of, Storm Spring, Iowa, California salmon, 1875.
Mississippi River, tributary of, Waukon, Iowa. California salmon, 1875.
Mississippi River, tributary of, Waverly, Iowa. Penobscot salmon, 1875.
Mississippi River, Wis., tributary of. California salmon, 1876.
Missouri River, Herman, Mo. Shad, 1872.
Missouri River, Mo. California salmon, 1880.
Missouri River. (See tributaries: Boyer River, Sioux, Nishnabottomy, Little Sioux and Floyd Rivers, Stranger, Verdigris, Delaware, Osage, and Marais des Cygnes Rivers, Gasconade, Platte, Grand, Chariton, and Osage Rivers; Sugar and Bean's Lakes.)
Missouri River, Lexington, Mo. California salmon, 1880.
Missouri River, Buchanan County, Mo. California salmon, 1880.
Missouri River, Saint Joseph, Mo. Shad, 1877; California salmon, 1880.
Missouri River, tributary of, Council Bluffs, Iowa. Penobscot salmon, 1875.
Missouri River, Washington, Mo. Shad, 1872.
Mitchell County, Kans. (See Beloit, Kans.)
Mitchell's Bridge, Md., Worcester County, Pocomoke River. California salmon, 1878.
Mitchell's Pond, Boxford, Mass. Schoodic salmon, 1877.
Mobile River. (See tributary: Alabama River.)
Modoc County, Cal. (See Clear Lake, Cal.)
Mohawk River, N. Y. California salmon, 1874, 1875.
Mohawk River, Oneida County, N. Y. California salmon, 1875.
Mohawk River, Rome, N. Y. Penobscot salmon, 1875.
Mohawk River. (See tributaries: Spring Creeks.)
Moingona, Iowa, Des Moines River. Shad, 1878.

Monkton, Baltimore County, Md., Gunpowder River. California salmon, 1877.
Monkton, Md., Little Gunpowder River. California salmon, 1876, 1876, 1877, 1878.
Monmouth Church, Rockbridge County, Va., Kerr's Creek. California salmon, 1880.
Monocacy River, Md. California salmon, 1878; Penobscot salmon, 1880.
Monocacy River. (See tributaries: Pipe, Owens, Bush, Double Pipe, and Big Pipe Creeks.)
Monongahela River, Greensburgh, Pa. Shad, 1873.
Monongahela River, tributary of, Greene County, Pa. California salmon, 1876.
Monongahela River, West Fork of, Clarksburgh, W. Va. California salmon, 1876; Schoodic salmon, 1878; shad, 1879.
Monongahela River, West Fork of, Walkersville, W. Va. California salmon, 1878.
Monongahela River, West Fork of, Weston, W. Va. Schoodic salmon, 1879.
Monongahela River. (See tributaries: Youghiogheny River, West Fork.)
Monroe County, Mich. (See Monroe, Mich.)
Monroe County, Miss. (See Aberdeen, Miss.)
Monroe County, N. Y., Allen Creek. Schoodic salmon, 1879.
Monroe County, N. Y., Spring Creek. California salmon, 1878.
Monroe County, N. Y., Watter Creek. California salmon, 1878.
Monroe County, N. Y. (See Wheatland, N. Y.)
Monroe County, Pa., several lakes. Schoodic salmon, 1878.
Monroe County, Wis. (See Sparta, Wis.; Tomah, Wis.; Tunnel City, Wis.)
Monroe, La., Ouachita River. Shad, 1879.
Monroe, Mich., lakes. Whitefish, 1880.
Monroe, Mich., Raisin River. California salmon, 1875, 1879; shad, 1873.
Monroeville, Ohio, Huron River. California salmon, 1874; shad, 1874.
Monrovia, Md., Bush Creek. California salmon, 1874.
Monrovia, Md., pond. California trout, 1880.
Monterey County, Cal., Espinoza Lake. Schoodic salmon, 1878.
Montezuma, Ga., Flint River. Shad, 1878.
Montcalm County, Mich. (See Pierson, Mich.)
Montgomery County, Ala. (See Montgomery, Ala.)
Montgomery County, Kans. (See Independence, Kans.)
Montgomery County, Ky. (See Mount Sterling, Ky.)
Montgomery County, Md. (See Barnesville, Md.; Boyd's, Md.; Rockville, Md.; Sandy Spring, Md.; Spencerville, Md.)
Montgomery County, Ohio. (See Dayton, Ohio.)
Montgomery County, Pa. (See Pottstown, Pa.)
Montgomery County, Va. (See Alleghany Springs, Va.; Big Spring Depot, Va.; Blacksburgh, Va.; Staunton Station, Va.)

Montgomery, Ala., Alabama River. Shad, 1876.
Montgomery, Ala., tributary of Alabama River. California salmon, 1876.
Montgomery, Ala., Tallapoosa River. Shad, 1877.
Montgomery County, Ky., Big Slate Creek. California salmon, 1877.
Montgomery County, Ky., Little Hinkston Creek. California salmon, 1877.
Montgomery County, Ky., Spencer Creek. California salmon, 1877.
Montgomery, White Sulphur Springs, Va., Roanoke River. California salmon, 1880.
Monticello, Iowa, Maquoketa River. California salmon, 1874.
Moorhead, Minn., Red River of the North. California salmon, 1877.
Moosehead Lake, Mount Kineo, Me. Schoodic salmon, 1879.
Moose Horn Lake, Carleton County, Minn. California salmon, 1878.
Moosehorn Waters, Charlotte, Me. Schoodic salmon, 1878.
Moose Lake, Carleton County, Minn. California salmon, 1877, 1878.
Morgan, Vt., Seymour Lake. Schoodic salmon, 1876.
Morgan County, Ill. (See Jacksonville, Ill.)
Morgan County, Mo., Lamine River. California salmon, 1880.
Morgan County, W. Va. (See Cherry Run Depot, W. Va.; and Sir John's Run, W. Va.)
Morganton, N. C., Catawba River. California salmon, 1880.
Morganton, N. C., ponds tributary to Catawba River. Schoodic salmon, 1878.
Morganton, N. C., John's River. California salmon, 1878, 1879; Schoodic salmon, 1878.
Morganton, N. C., Linville River. California salmon, 1879.
Morganton County, N. C., Linville River. Schoodic salmon, 1878.
Morganton, N. C., South Fork River. California salmon, 1879.
Morganton, N. C., Upper Creek. California salmon, 1879.
Morris County, N. J., Lake Hopatcong. California salmon, 1879; whitefish, 1876.
Morris County, N. J., lakes. Schoodic salmon, 1879.
Morris County, N. J., Shepherd's Pond. Whitefish, 1876.
Morris County, N. J. (See Dover, N. J.; Drakesville, N. J.; Morristown, N. J.)
Morrisania, N. Y., creek. California salmon, 1876, 1877.
Morrison Lake, Branch County, Mich. California salmon, 1875.
Morrison Lake, McLeod County, Minn. California salmon, 1876.
Morristown, N. J., Whippany River. Penobscot salmon, 1875.
Moses Wood Pond, White Haven, Pa. Schoodic salmon, 1879.
Mossy Creek, S. C. California salmon, 1880.
Moswansicut Pond, North Scituate. Schoodic salmon, 1876, 1878.
Moultrie County, Ill. (See Farlow, Ill.)
Mountain Lake, Cottonwood County, Minn. California salmon, 1877.
Mountain Lake, Giles County, Va. California salmon, 1876.
Mount Airy, Md., Little Patuxent River. California salmon, 1879.

Mount Airy, Md., North Patuxent River. California salmon, 1876.
Mount Airy, Md., Patuxent River. California salmon, 1878.
Mount Carroll, Ill., Carroll Creek. California salmon, 1877, 1879.
Mount Jackson, Va., N. Fork, Shenandoah River. California salmon, 1876.
Mount Kineo, Me., Moosehead Lake. Schoodic salmon, 1879.
Mount Olive, N. C., Goshen Creek. Shad, 1879.
Mount Pleasant, Md., pond. California trout, 1880; Schoodic salmon, 1880.
Mount Sterling, Ky., Licking River. Shad, 1877.
Mount Vernon, Ohio, Vernon River. California salmon, 1879.
Mower County, Minn., Cedar River. California salmon, 1875.
Mower County, Minn., Iowa River. California salmon, 1875.
Mower County, Minn., Little Iowa River. California salmon, 1878.
Mower County, Minn., Mary's Creek.
Mower County, Minn. (See Austin, Minn.)
Moxley Point, Prince George's County, Md., Potomac River. Shad, 1875, 1880.
Mud Lake, Iowa. California salmon, 1879.
Mud, or Hydraulic, Lake, Herkimer County, N. Y. California salmon, 1874.
Mulberry Creek, Shelby County, Ky. California salmon, 1876.
Mullica River, Burlington County, N. J. California salmon, 1879.
Mullica River, Camden, N. J. California salmon, 1877.
Mullica River, Egg Harbor City, N. J. California salmon, 1877.
Mullica River, N. J. California salmon, 1877, 1878.
Mumfordsville, Ky., Green River. Shad, 1877.
Muncy Lake, Cass County, Mich. California salmon, 1876.
Muscatine County, Iowa. (See Wilton, Iowa.)
Muscogee County, Ga. (See Columbus, Ga.)
Musconetcong River, Bloomsbury, N. J. California salmon, 1874.
Musconetcong River, N. J. Penobscot salmon, 1873, 1874, 1875.
Muskegon River, Mich. Penobscot salmon, 1873.
Muskegon River. (See tributaries: Clam Lake, Crooked Lake, Hersey.)
Muskegon River. (See tributary: Higgins Lake.)
Muskingum County, Ohio. (See Zanesville, Ohio.)
Muskingum River, Bayard, Ohio. Shad, 1875.
Muskingum River, Coshocton, Ohio. California salmon, 1877.
Muskingum River, Millbrook, Ohio. California salmon, 1873.
Muskingum River, Zanesville, Ohio. Shad, 1876.
Mystic Lake, Medford, Mass. Schoodic salmon, 1877, 1880.
Mystic Lake, Winchester, Mass. Schoodic salmon, 1876, 1877, 1878, 1880.
Mystic River, branch of, Mass. California salmon, 1873, 1874, 1874, 1875.
Mystic River, tributary of, Mass. Penobscot salmon, 1873.

Mystic River. (See tributary: Main river.)
Nagawica Lake, Wis. California salmon, 1879; Schoodic salmon, 1879,
Nankeag Lake, Ashburnham, Mass. Schoodic salmon, 1876, 1877, 1878. 1879, 1880.
Nansemond County, Va. (See Suffolk, Va.)
Nansemond River, south branch of Seaboard and Roanake Railroad crossing, Va. Shad, 1878, 1878.
Nansemond River, South Branch, Suffolk, Va. Shad, 1878.
Nanticoke River, branch of, Federalsburgh, Md. California salmon, 1876.
Nanticoke River, Federalsburgh, Md. California salmon, 1879, 1880; shad, 1878, 1879.
Nanticoke River, Hillsborough, Md. California salmon, 1878.
Nanticoke River, Seaford, Del. California salmon, 1876, 1878, 1880; shad, 1877, 1879, 1880.
Nantucket, Mass., Hummock Pond. Schoodic salmon, 1877.
Nash's Lake, Calais, Me. Schoodic salmon, 1879.
Nashua River, Lancaster, Mass. California salmon, 1876, 1877; Penobscot salmon, 1876.
Nashville, Tenn., Cumberland River. Shad, 1875, 1875, 1879.
Natchaug branch of Thames River, Conn. Penobscot salmon, 1877.
Natchaug River, Conn. California salmon, 1876.
Natchaug River, North Windham, Conn. California salmon, 1875.
Natick, Mass., Dug Pond. Schoodic salmon, 1876, 1877, 1878, 1879.
Neabsco Mills, Md., Neabsco River. Shad, 1878.
Neabsco River, Neabsco Mills, Md. Shad, 1878.
Negaunee, Mich., Carp River. California salmon, 1874.
Nelson County, Ky., Rolling Fork of Salt River. California salmon, 1877.
Nelson County, Va., Tye River. California salmon, 1876; Schoodic salmon, 1877.
Nelson, N. H., Newfound Lake. Schoodic salmon, 1880.
Nelson, N. H., Tolman Pond. Schoodic salmon, 1880.
Nemaha County, Kans. (See Centralia, Kans.)
Neosho River, Emporia, Kans. California salmon, 1878, 1879, 1880; shad, 1879.
Neosho, Mo., Shoal Creek. Shad, 1878.
Neosho River. (See tributaries: Cottonwood River and Doyle Creek.)
Neuse River, New Berne, N. C. Shad, 1873.
Neuse River, Neuse, N. C. Shad, 1878.
Neuse River, Wake County, N. C. Shad, 1877.
Neuse River, Raleigh, N. C. Shad, 1877, 1878, 1879.
Neuse River. (See tributary: Contentnea Creek.)
Neuse, N. C., Neuse River. Shad, 1878.
Nevada County, Cal., Donner Lake. Schoodic salmon, 1878; whitefish, 1877.
Nevada County, Cal., Sereno Lake. Schoodic salmon, 1878.

Nevada County, Cal., Tahoe Lake. Whitefish, 1879.
New Berne, N. C., Neuse River. Shad, 1873.
Newberry Pond, Geauga County, Ohio. California salmon, 1879.
New Buffalo, Mich., Lake Michigan. Whitefish, 1876.
Newbury, N. H., Sunapee Lake. Schoodic salmon, 1878, 1879.
Newbury, Vt., Connecticut River. Penobscot salmon, 1874.
New Castle County, Del. (See Blackbird, Del.; Wilmington, Del.)
New Comerstown, Ohio, Tuscarawas River. California salmon, 1878.
New Durham, N. H., Merrymeeting Lake. Schoodic salmon, 1878, 1879.
Newechewannock Lake, Wakefield, N. H. California salmon, 1879.
Newfound Lake, Bridgewater, N. H. Schoodic salmon, 1879.
Newfound Lake, Nelson, N. H. Schoodic salmon, 1880.
New Hartford, Conn., Farmington River. California salmon, 1875; Penobscot salmon, 1875, 1877.
New Haven County, Conn. (See Branford, Conn.; East Haven, Conn.; Guilford, Conn.; Meriden, Conn.; Middlebury, Conn.; New Haven, Conn.; North Branford, Conn.; Northford, Conn.; Woodbridge, Conn.)
New Haven, Conn., Farm River. California salmon, 1875.
New London County, Conn. (See Lyme, Conn.; Salem, Conn.)
New Market, Md., Bush Creek. California trout, 1880.
New Milford, Conn., Butter Brook. Penobscot salmon, 1875; California salmon, 1874.
New Milford, Conn., Housatonic River. California salmon, 1875; Penobscot salmon, 1877; shad, 1873, 1874.
Newport, Ark., White River. California salmon, 1878; shad, 1876.
Newport, Me., Newport Pond. Schoodic salmon, 1878.
Newport, Pa., Juniata River. California salmon, 1877.
Newport Pond, Newport, Me. Schoodic salmon, 1878.
New Preston, Conn., Waremaug Lake. Schoodic salmon, 1877.
New River, Central, Va. California salmon, 1874; Schoodic salmon, 1875, 1880; shad, 1873.
New River, Hinton, W. Va. California salmon, 1879, 1880; shad, 1879.
New River, Lead Mines, Va. Schoodic salmon, 1880.
New River, Wytheville, Va. Schoodic salmon, 1877, 1878, 1880.
New River, Blacksburg, Va. Schoodic salmon, 1878.
New River. (See tributaries: Totes Run, Reed Creek, Fates Run.)
Newton, Mass., Crystal Lake. Schoodic salmon, 1877.
Newton, N. C., Clark's Creek. California salmon, 1879.
Newton County, Ga. (See Covington, Ga.)
Newton County, Mo. (See Neosho, Mo.)
Newtown, Conn., tributary to Housatonic River. Schoodic salmon, 1879.
Newtown, Md., branch of Pocomoke Bay. California salmon, 1876.
Newtown, Somerset County, Md., Pocomoke River. Shad, 1879.
Newville, Pa., Spring Creek. California salmon, 1877.
New Windsor, Md., Pipe Creek. California salmon, 1878.
New York County, N. Y. (See Morrisania, N. Y.)

Nichols, S. C., Little Pee Dee River. Shad, 1880.
Nicollet County, Minn. (See Saint Peter, Minn.)
Niles, Berrien County, Mich., Tinkham Lake. Schoodic salmon, 1878.
Niles, Mich., private ponds. California salmon, 1877.
Niles, Mich., Saint Joseph's River. California salmon, 1875; shad, 1873.
Nine Mile Pond, Wilbraham, Mass. Schoodic salmon, 1877.
Nine Springs Creek, Wis. California salmon, 1879.
Nipmug Pond, Mendon, Mass. Schoodic salmon, 1876, 1879, 1880.
Nishnabottomy River, Atlantic, Iowa. California salmon, 1875.
Noble County, Ind. (See Rome City, Ind.)
Noble County, Minn., Ochuda Lake. California salmon, 1877.
Noble County, Minn., Okabena Lake. California salmon, 1876, 1877.
Noble County, Minn., Round Lake. California salmon, 1880.
Nodaway River, R. R. crossing, Nodaway County, Mo. Shad, 1880.
Nodaway County, Mo., Nodaway River, Platte River, and One Hundred and Two River. Shad, 1880.
Nolin Creek, Elizabethtown, Ky. Schoodic salmon, 1878.
Nolin Creek, Hardin County, Ky. California salmon, 1877.
Norcross, Ga., Chattahoochee River. California salmon, 1877.
Norfolk, Conn., Smith Pond. Schoodic salmon, 1876.
Norfolk County, Mass. (See Braintree, Mass.; Milton, Mass.; Nantucket, Mass.; Sharon, Mass.; South Weymouth, Mass.; Wellesley, Mass.)
Norrisville, Md., McDonald's Run. California trout, 1880.
Norrisville, Md., pond. Schoodic salmon, 1880.
Northampton County, Pa., Bushkill Creek. Penobscot salmon, 1874.
Northampton County, Pa. (See Easton, Pa.)
North Andover, Mass., Great Pond. Schoodic salmon, 1876, 1878.
North Boardman River, Kalkaska, Mich. California salmon, 1876.
North Branford, Conn., Main River. Penobscot salmon, 1873.
North Branford, Conn., Mill River. California salmon, 1874.
North East Creek, Md. California salmon, 1880.
North East Creek, North East, Md. California salmon, 1878.
North East, Md., North East Creek. California salmon, 1878.
North East, Md., Sharon's Run. California salmon, 1880.
North East River, Cecil County, Md. Shad, 1878.
North East River, Carpenter's Point, Md. Shad, 1876.
North East River, Havre de Grace, Md. Shad, 1878.
North East River. (See tributary: North East Creek.)
Northfield Lake, Rice County, Minn. Schoodic salmon, 1878.
Northfield, Minn., Cedar Lake. California salmon, 1877.
Northfield, Minn., Robert's Lake. California salmon, 1877.
Northfield, Minn. Schoodic salmon, 1875.
Northfield, Merrimac County, N. H., Chestnut Pond. Schoodic salmon, 1879.
Northfield, Vt., Dog River. Penobscot salmon, 1874.

Northford, Conn., West River. California salmon, 1873.
North Maquoketa River, Worthington, Iowa. Penobscot salmon, 1875.
North Patapsco River, Tank Station, Md. California salmon, 1879.
North Patapsco River, Tank Station, West. Md. R. R., Md. California salmon, 1874.
North Patuxent River, Mount Airy, Md. California salmon, 1876.
North Pond, Sandwich, N. H. Schoodic salmon, 1880.
North Pond, Stark, N. H. Schoodic salmon, 1880.
North River, Burnt Bridge, Va. California salmon, 1880.
North River, Camden County, N. C. Shad, 1879.
North River, Ker's Creek Bridge, Va. California salmon, 1878, 1879.
North River, Lexington, Va. California salmon, 1877, 1878; Schoodic salmon, 1879.
North River, Mass. California salmon, 1875, 1876, 1877.
North Rochester, Mass., Snow's Pond. Schoodic salmon, 1878.
North Sandwich, Mass., Great Herring Pond. Schoodic salmon, 1876, 1878.
North Scituate, R. I., Moswansicut Pond. Schoodic salmon, 1876, 1878.
North Scituate, R. I., Steen's Pond. Schoodic salmon, 1876, 1878.
Northumberland County, Pa. (See Chillisquaque, Pa.)
Northville, Mich., ponds. California trout, 1880.
Northville, Mich., Rouge River. California salmon, 1876; Schoodic salmon, 1878; Whitefish, 1876.
Northville, Mich., Yerke's Lake. Whitefish, 1876.
North Windham, Conn., Natchaug River. California salmon, 1875.
Norwich Pond, Huntington, Mass. Schoodic salmon, 1877.
Notalbany River, Tickfaw, La. California salmon, 1876; shad, 1875.
Nottoway County, Va. (See Nottoway, Va.)
Nottoway, Va., Nottoway River. Shad, 1878, 1879.
Nottoway River, Nottoway, Va. Shad, 1878, 1879.
Nutt's Pond, Manchester, N. H. Schoodic salmon, 1879.
Oak County, Mich., Oxbow Lake. Whitefish, 1876.
Oak County, Mich., Strait's Lake. Whitefish, 1876.
Oak County, Mich., Walled Lake. Whitefish, 1876.
Oakland County, Mich., Hontoon Lake. California salmon, 1875.
Oakland County, Mich., Orchard Lake. California salmon, 1875; Penobscot salmon, 1873.
Oakland County, Mich., Lake Orion. California salmon, 1875.
Oakland County, Mich., Rouge River. California salmon, 1875.
Oakland County, Mich., Wall's Lake. Penobscot salmon, 1873.
Oakland County, Mich. (See Holly, Mich.; Pontiac, Mich.; Rochester, Mich.)
Oakland, Md., Little Youghiogheny River. Schoodic salmon, 1880.
Oakland, Md., pond. California trout, 1880; Schoodic salmon, 1880.
Oakland, Md., Youghiogheny River. California salmon, 1876.
Oak Orchard Creek, Orleans County, N. Y. California salmon, 1874.

Obion County, Tenn. (See Paducah Junction, Tenn.)
Obion River, South Fork of, Huntingdon, Tenn. Shad, 1878.
Occoquan Falls. (See tributary: Broad Run.)
Oceana County, Mich., Crystal Lake. California salmon, 1879.
Oceana County, Mich., Round Lake. California salmon, 1879.
Ochuda Lake, Noble County, Minn. California salmon, 1877.
Ocilla River, Jefferson County, Fla. Shad, 1879.
Ockolockonee River, Midway, Fla. Shad, 1879.
Ocmulgee River, Covington, Ga. California salmon, 1878; shad, 1877.
Ocmulgee River, Macon, Ga. California salmon, 1878; shad, 1868, 1877, 1878, 1879.
Ocmulgee River. (See tributaries: Ulcofanhanchee River and Yellow River.)
Oconee County, S. C. (See Seneca, S. C.)
Oconee, Ga., Oconee River. California salmon, 1876.
Oconee River, R. R. Crossing, Greene County, Ga. California salmon, 1876.
Oconee River, Milledgeville, Ga. California salmon, 1878; shad, 1876, 1877, 1880.
Oconee River, R. R. Crossing, Ga. Shad, 1880.
Oconomowoc Creek. (See tributary: Oconomowoc Lake.)
Oconomowoc Lake, Oconomowoc, Wis. Penobscot salmon, 1873.
Oconomowoc Lake, Waukesha County, Wis. California salmon, 1877.
Oconomowoc, Wis., Oconomowoc Lake. Penobscot salmon, 1873.
Octorora Creek, Liberty Grove, Md. California salmon, 1874.
Octorora Creek, Rowlandville, Md. California salmon, 1876, 1878.
Octorora River, De Graw's, Cecil County, Md. California salmon, 1879, 1880.
Octorora River, Harris Dam, Cecil County, Md. California salmon, 1880.
O'Dowd's Lake, Scott County, Minn. California salmon, 1877, 1878.
Ogden River, Weber County, Utah. California salmon, 1876.
Ogeechee River, Crawfordsville, Ga. California salmon, 1877.
Ohio County, W. Va. (See Cold Spring, W. Va.; Wheeling, W. Va.)
Ohio River, Parkersburgh, W. Va. California salmon, 1879, 1880.
Ohio River. (See tributaries: Tanner's Creek, Wabash River, White River, Floyd's Fork, Clear, Mulberry, Gut, Stoner, Pittman, Knob, Spencer, Big State, Eddy, Hurricane Creeks, Kentucky, Little Sandy, Green, Little Kentucky, Little Hinkston, South Elkhorn, Barren and Little Rivers, Rolling Fork, Booker's Branch, Cave Spring Branch, Doe Run, Licking, Cumberland, Salt, Allegheny, Buckingahela, Scioto, Black, Huron, Muskingum, Walhonding, Whitstone, Tuscarawas, Miami, Little Miama, Monongahela, Tennessee, Cheat, Tygart's Valley, West Fork, New, Hugh's, Little Kanawha, Green Brier Rivers; Castalia Springs, Middle Island, Fish, Wheeling, Sinking, Fishing, Buffalo, and Kings Creeks.)

Okabena Lake, Noble County, Minn. California salmon, 1876, 1877.
Okatibee Creek, Meridian, Miss. Shad, 1878.
Old Bay Fishery, Md., Susquehanna River. Shad, 1879.
Old Fort, N. C., Catawba River. California salmon, 1878, 1879.
Oldman's Creek, N. J. California salmon, 1877.
Oldman's Creek, Swedesborough, N. J. California salmon, 1876.
Olmstead County, Minn., Root River. California salmon, 1877.
One Hundred and Two River, Nodaway County, Mo. California salmon, 1880; shad, 1880.
Oneida County, N. Y., Mohawk River. California salmon, 1875.
Oneida County, N. Y., Sequoit Creek. California salmon, 1875.
Oneida County, N. Y., Spring Creeks. California salmon, 1878.
Oneida County, N. Y. (See Fish Creek, N. Y.; Rome, N. Y.)
Oneida Lake, N. Y. California salmon, 1874.
Onondago County, N. Y. (See Skaneateles, N. Y.)
Ontario County, N. Y., Spring Brooks. California salmon, 1879.
Ontario Lake. (See tributaries: Allen, Beaver, Fish, Caledonia, Oak Orchard, Sandy, Spring, and Springbrook Creeks; Genesee, Salmon, and Oswego Rivers; Caledonia Springs, Honeoye Falls, Conesus Lake.)
Orchard Lake, Oakland County, Mich. California salmon, 1875; Penobscot salmon, 1873.
Orange County, Vt. (See Newbury, Vt.)
Orangeburgh County, S. C. (See Branchville, S. C.; Orangeburgh, S. C.)
Orangeburgh, S. C., Edisto River. California salmon, 1879.
Oriskany River, N. Y. California salmon, 1874.
Orleans County, N. Y., Oak Orchard Creek. California salmon, 1874.
Orleans County, N. Y., Sandy Creek. California salmon, 1874.
Orleans County, Vt. (See Barton, Vt.; Morgan, Vt.; Rochester, Vt.; Westmore, Vt.)
Ormsby County, Nev. (See Carson City, Nev.)
Orono River, Minn. California salmon, 1877.
Ortonville, Minn., Big Stone Lake. California salmon, 1880.
Orwell, Vt., pond. Schoodic salmon, 1876.
Osage County, Kans. (See Burlingame, Kans.)
Osage River, Redding, Kans. California salmon, 1878, 1879.
Osage River, Schell City, Mo. California salmon, 1880; shad, 1880.
Osage River. (See tributary: Marais des Cygnes River.)
Osakin Lake, Todd County, Minn. California salmon, 1877.
Osceola County, Mich. (See Le Roy, Mich.; Reed City, Mich.)
Ossipee Lake, Ossipee N. H. Schoodic salmon, 1879.
Ossipee, N. H., Ossipee Lake. Schoodic salmon, 1879.
Oswego County, N. Y. (See Fulton, N. Y.; Sand Bank, N. Y.)
Oswego River, Fulton, N. Y. California salmon, 1874.
Oswego River, N. Y. California salmon, 1873, 1874, 1874, 1874, 1874; Penobscot salmon, 1873.
Oswego River, Skaneateles, N. Y. California salmon, 1874, 1875.

Otis, Mass., ponds. Schoodic salmon, 1880.
Otsego County, Mich. (See Otsego Lake, Mich.)
Otsego Lake, Otsego County, Mich. California salmon, 1875.
Ottawa County, Ohio. (See Elmore, Ohio; Put-in Bay, Ohio.)
Ottawa, Kans., Wakasa River. California salmon, 1878, 1879.
Ottawa River. (See tributary: North River.)
Otter Creek, Madison County, Ky. California salmon, 1876.
Otter Creek, Vergennes, Vt. Shad, 1873, 1874.
Otter River, Minn. Penobscot salmon, 1875; Schoodic salmon, 1875.
Otter Tail County, Minn. (See Perham, Minn.)
Otter Tail River, Frazer City, Minn. California salmon, 1880.
Otter Tail, Forks of, and Bois des Sioux River, Stevens County, Minn. California salmon, 1877.
Ottumwa, Iowa, Des Moines River. California salmon, 1875; shad, 1874.
Ouachita County, La. (See Monroe, La.)
Ouachita River, Clark County, Ark. Shad, 1879.
Ouachita River, Monroe, La. Shad, 1879.
Ouachita River. (See tributaries: Sabine, Bœuf, Caddo, and Saline Rivers, Washita.)
Ousley, Ga., Little River. Shad, 1879.
Outagamie County, Wis. (See Appleton, Wis.)
Owatonna, Minn., Cannon River. California salmon, 1877.
Owatonna River, Steele County, Minn. California salmon, 1875; Schoodic salmon, 1875; Penobscot salmon, 1875.
Owen, Winnebago County, Ill. Brown's Creek. California salmon, 1877.
Owen's Creek, Mechanicstown, Md. California salmon, 1874, 1878, 1879.
Owen's Creek, Slabtown, Md. California salmon, 1874, 1876, 1876, 1876.
Owosso, Mich., Shiawassee River. California salmon, 1875.
Orbow Lake, Oak County, Mich. Whitefish, 1876.
Oxford, Ala., Cold Water Creek. California salmon, 1878.
Oxford, Iowa, Wapsipinicon River. California salmon, 1875.
Oxford, Warren County, N. J., Green's Pond. Schoodic salmon, 1879.
Pacific, Mo., Meramec River. California salmon, 1876; shad, 1876.
Packlette River, Spartanburg C. H., S. C. California salmon, 1879.
Paducah Junction, Tenn., West Obion River. Shad, 1879.
Palmer, Mass., Quobaug Pond. Penobscot salmon, 1874.
Palmyra, Mich., Palmyra Pond. California salmon, 1878.
Palmyra Pond, Palmyra, Mich. California salmon, 1878.
Pamlico Sound. (See tributary: Tar River.)
Parker Lake, Richland, Mich. Schoodic salmon, 1876.
Parkersburgh, W. Va., Bartlett's Pond. Schoodic salmon, 1878.
Parkersburgh, W. Va., Ohio River. California salmon, 1879, 1880.
Parkersburgh, W. Va., ponds. Schoodic salmon, 1879.
Parkton, Md., Big Gunpowder River. California salmon, 1878.

Parkton, Md., Deer Creek. California salmon, 1878, 1879.
Parkton, Md., Gunpowder River. California salmon, 1876, 1878.
Pascagoula River. (See tributary: Chickasawha River.)
Passadumkeag River, Me. Penobscot salmon, 1874.
Passaic County, N. J., Greenwood Lake. California salmon, 1879.
Passaic County, N. J., Passaic River. Schoodic salmon, 1879.
Passaic County, N. J. (See Paterson, N. J.; Ringwood, N. J.)
Passaic River, Passaic County, N. J. Schoodic salmon, 1879.
Passaic River, tributary of, N. J. Penobscot salmon, 1874.
Passaic River, tributary of, Paterson, N. J. California salmon, 1874, 1875.
Passaic River. (See tributaries: Whippaug River and Rockaway River.)
Passumpsic tributaries, Wheelock, Vt. Penobscot salmon, 1874.
Patapsco Falls, Ellicott City, Md. California trout, 1880.
Patapsco Falls, lake tributary to, Reisterstown, Md. Schoodic salmon, 1879.
Patapsco River, Double Pipe Creek, Md. California salmon, 1878.
Patapsco River, Hood's Creek, Md. California salmon, 1878.
Patapsco River, Hood's Mills, Md. California salmon, 1874, 1878, 1879.
Patapsco River, Relay Station, Md. Shad, 1879.
Patapsco River, Sykesville, Md. California salmon, 1876, 1878.
Patapsco River. (See tributaries: North Patapsco River, Cascade Branch, Water Works, and Owen's Creek.)
Patapsco River, North Branch of, Tank Station, Md. California salmon, 1876, 1876, 1876, 1878.
Patapsco River, tributary of, Sulphur Spring, Md. California trout, 1880; Schoodic salmon, 1880.
Patchen's Lake, Grant Co., Minn. California salmon, 1878.
Paterson, N. J., tributary of Passaic River. California salmon, 1874.
Pattenburgh Creek, Raritan, N. J. California salmon, 1874.
Patten's Brook, Surry, Me. Penobscot salmon, 1876.
Patterson Lake, Dexter, Mich. Whitefish, 1876.
Patterson Lake, Putnam, Mich. California salmon, 1878.
Patterson's, Caldwell County, N. C. Yadkin River. California salmon, 1878, 1878, 1879.
Patuxent, Md., Little Patuxent River. California salmon, 1875.
Patuxent, Md., Patuxent River. Shad, 1879.
Patuxent, Md., streams. California trout, 1880.
Patuxent River, Airey, Md. California salmon, 1879.
Patuxent River, Baltimore, Md. Schoodic salmon, 1880.
Patuxent River, branch of, Howard County, Md. California salmon, 1874.
Patuxent River, Cedar Point, Md. California salmon, 1876, 1876.
Patuxent River, Laurel, Md. California salmon, 1875, 1876, 1878, 1878, 1878, 1878, 1879; shad, 1877, 1878, 1879, 1880.
Patuxent River, Md. Penobscot salmon, 1875.

Patuxent River, Mount Airy, Md. California salmon, 1878.
Patuxent River, North Branch of, Ellicott City, Md. California salmon, 1876.
Patuxent River, Patuxent, Md. Shad, 1879.
Patuxent River, Savage, Md. California salmon, 1874, 1876, 1878, 1878, 1878, 1879, 1880; shad, 1879, 1880, 1880, 1880, 1880.
Patuxent River, Spencerville, Md. California salmon, 1878.
Patuxent River, Tank Station, Md. California salmon, 1878.
Patuxent River. (See tributaries: Little Patuxent River, Middle Patuxent River and Pond, Rocky Run, Pond, Trout Branch, and Gunpowder River.)
Patuxent River, tributary of, Spencerville, Md. Schoodic salmon, 1878.
Paulinskill River, N. J. Penobscot salmon, 1875.
Paulinskill Creek, Warren County, N. J. California salmon, 1879.
Paupock Lake, Scranton, Pa. Schoodic salmon, 1879.
Pawcatuck River, R. I. Penobscot salmon, 1873.
Pawcatuck River, ponds tributary to, R. I. California salmon, 1876.
Pawcatuck River, Washington County, R. I. California salmon, 1875; shad, 1874, 1875.
Pawcatuck River, tributary of, R. I. California salmon, 1876; Penobscot salmon, 1874.
Pawnee County, Kans. (See Larned, Kans.)
Pawnee Creek, Larned, Kans. California salmon, 1878, 1879.
Pawnee River, Larned, Kans. Shad, 1879.
Paw Paw, Mich., Paw Paw River. California salmon, 1875.
Paw Paw River, North Branch of, Almena, Mich. California trout, 1880.
Paw Paw River, Paw Paw, Mich. California salmon, 1875.
Paw Paw River. (See tributaries: Bucks Creek, Mill Stream, North Branch of Big Paw Paw River.)
Pawtuxet River, R. I. California salmon, 1875.
Pawtuxet River, North Branch of, sundry places, R. I. Penobscot salmon, 1876.
Pawtuxet River, R. I. Penobscot salmon, 1873.
Pawtuxet River, Providence County, R. I. Penobscot salmon, 1875; shad, 1874, 1875.
Pawtuxet River, South Branch of, sundry places, R. I. Penobscot salmon, 1876.
Pawtuxet River, tributary of, R. I. California salmon, 1876; Penobscot salmon, 1874.
Pawtuxet River. (See tributaries: North and South Branch.)
Paxton, Mass., Asnebumskitt Pond. Schoodic salmon, 1879.
Pea River, Union Springs, Ala. Shad, 1879.
Pearl Lake, Stearns County, Minn. California salmon, 1876, 1878.
Pearl River, Jackson, Miss. Shad, 1875, 1876, 1879.
Pearl River, Kosciusko, Miss. California salmon, 1876.
Pearl River. (See tributary: Forked Deer River.)

Peatwig Creek, Fort Edward, N. Y. California salmon, 1874.
Peavine Creek, Cass County, Mich. California salmon, 1875, 1879.
Pecatonica River. (See tributary: Knapp's Creek.)
Pedlar River, Amherst County, Va. California salmon, 1876.
Pee Dee River, S. C. California salmon, 1880.
Pee Dee River. (See tributary: Yadkin River.)
Pelican River. (See tributary: Detroit Lake.)
Pembroke, Me. Penmaquan River. California salmon, 1879.
Pemigewasset River, Campton and Plymouth, N. H. California salmon, 1876, 1878, 1879.
Pemigewasset River, Franklin, N. H. Penobscot salmon, 1876.
Pemigewasset River, Livermore Falls, N. H. Penobscot salmon, 1876.
Pemigewasset River, Plymouth, N. H. California trout, 1880; Penobscot salmon, 1875.
Penmaquan River, Pembroke, Me. California salmon, 1879.
Penmaquan River, Me. Penobscot salmon, 1874, 1876.
Pennsborough, W. Va., Hugh's River. California salmon, 1878.
Penn's Creek, Mifflinburg, Pa. California salmon, 1879.
Penn's Creek, Snyder County, Pa. California salmon, 1877.
Penobscot County, Me. (See Dexter, Me.; Enfield, Me.; Glenburn, Me.; Howland, Me.; Kingman, Me.; Mattawamkeag, Me.; Newport, Me.; Whitney Ridge, Me.; and Winn, Me.
Penobscot River, Me. Shad, 1877.
Penobscot River, Mattawamkeag, Me. Shad, 1880.
Penobscot River, tributary of, Danforth, Me. Penobscot salmon, 1875.
Penobscot River, tributary of, Kingman, Me. Penobscot salmon, 1875.
Penobscot River, tributary of, Me. Penobscot salmon, 1873.
Penobscot River, Winn, Me. Penobscot salmon, 1876.
Penobscot River. (See tributaries: Craig's Pond, Mattawamkeag River, Salmon Stream, Baskahegan, Passadumkeag River, Seboois Stream, Piscataquis River, Pleasant River, Sebec Lake, and Madaceunk Stream.)
Pentucket Pond, Georgetown, Mass. Schoodic salmon, 1877.
Perch Lake, Walworth Co., Wis. California salmon, 1878.
Pere Marquette River. (See tributary: Big Star Lake.)
Perham, Minn., Pine Lakes. Penobscot salmon, 1875.
Perkins and Hess Pond, Grand Rapids, Mich. California salmon, 1874.
Perry County, Pa. (See Newport, Pa.)
Perry County, Pa., Trout Run. California salmon, 1877.
Perryman, Md., Bush River. Shad, 1878, 1880.
Perry's Pond, Southport, Conn. Schoodic salmon, 1880.
Peru, N. Y., Salmon River. Penobscot salmon, 1875.
Peterborough, N. H., Cunningham Pond. Schoodic salmon, 1880.
Petersburgh, Va., Appomattox River. Shad, 1878, 1880.
Peterson Lake, Pope County, Minn. California salmon, 1878.
Petosky, Mich., Crooked Lake. Whitefish, 1876.

Petosky, Mich., Pine Lake. California salmon, 1876.
Petosky, Mich., Round Lake. Whitefish, 1876.
Petosky, Mich., Twin Lake. Whitefish, 1876.
Phalon Lake, Ramsey County, Minn. California salmon, 1876, 1877.
Phelps County, Mo. (See Jerome, Mo.)
Philadelphia County, Pa. (See Philadelphia, Pa.)
Philadelphia, Pa., Schuylkill River. California salmon, 1877.
Phœnix, Md., Gunpowder River. California salmon, 1876, 1877, 1880.
Phœnix, Md., stream. California trout, 1880, 1880, 1880.
Pickerel Lake, Freeborn County, Minn. California salmon, 1876, 1878.
Pickerel Lake, Kent County, Minn. California salmon, 1876.
Piedmont, Mo., Big Black River. Shad, 1879.
Piedmont, W. Va., Potomac River. California salmon, 1877; shad, 1876, 1879.
Pierce City, Mo., Capo Creek. California salmon, 1878.
Piermont, N. H., Tarlton Pond. Schoodic salmon, 1879.
Pierson, Montcalm County, Mich., Whitefish Lake. Schoodic salmon, 1878.
Pigeon River, Asheville, N. C. California salmon, 1878.
Pike County, Pa., several lakes. Schoodic salmon, 1878.
Pike County, Pa. (See Bushkill, Pa.)
Pikesville, Md., pond. Schoodic salmon, 1880.
Pikesville, Md., stream. California trout, 1880.
Pilot Mound, Minn., tributary of Root River. California salmon, 1878.
Pine City, Minn., tributaries of Saint Croix River. California salmon, 1877.
Pine County, Minn., Big Lake. California salmon, 1875.
Pine County, Minn., Saint Louis River. California salmon, 1875, 1875.
Pine County, Minn., Twin Lakes. California salmon, 1875.
Pine County, Minn. (See Pine City, Minn.)
Pine Creek, Cass County, Mich. California salmon, 1879.
Pine Creek, Pa. California salmon, 1875.
Pine Creek, Winona County, Minn. California salmon, 1878.
Pine Lake, Petosky, Mich. California salmon, 1876.
Pine Lakes, Perham, Minn. Penobscot salmon, 1875.
Pine Meadow, Conn., Farmington River. California salmon, 1874, 1874.
Pine River, Mich. Penobscot salmon, 1874.
Pine River, Richland Centre, Wis. California salmon, 1877.
Pine Tree Lake, Washington County, Minn. California salmon, 1876.
Pipe Creek, New Windsor, Md. California salmon, 1878.
Pipe Creek, Union Bridge, Md. California salmon, 1874.
Pipe Creek, Wakefield, Md. California salmon, 1874, 1876.
Pipe Creek, Westminster, Md. California salmon, 1876.
Piscataquis County, Me. (See Brownville, Me.; Dover, Me.; Milo, Me.; Mount Kineo, Me.)
Piscataquis River, Dover, Me. Penobscot salmon, 1874.

Piscataquis River, Milo, Me. Penobscot salmon, 1874.
Pitman Creek, Somerset, Ky. Schoodic salmon, 1878.
Pitaquog Pond, Durham, Conn. Schoodic salmon, 1880.
Pittman Creek, Taylor County, Ky. California salmon, 1877.
Pittsburgh, N. H., Connecticut Lake. Schoodic salmon, 1879.
Pittsfield, Mass., Pontoosuc Lake. Schoodic salmon, 1876, 1877, 1878, 1880.
Pittsfield, N. H., Berry Pond. Schoodic salmon, 1880.
Placer County, Cal., Donner Lake. Schoodic salmon, 1878.
Placer County, Cal., Sereno Lake. Schoodic salmon, 1878.
Placer County, Cal., Tahoe Lake. Whitefish, 1877.
Plainville, Conn., Plainville Reservoir. Schoodic salmon, 1880.
Plainville Reservoir, Plainville, Conn. Schoodic salmon, 1880.
Platte County, Mo., Bean's Lake. California salmon, 1880.
Platte County, Mo., Sugar Lake. California salmon, 1880.
Platte River, Denver, Colo. Shad, 1872.
Platte River, Buchanan County, Mo. California salmon, 1880; shad, 1880.
Platte River. (See tributary: Smith Fork.)
Pleasant Lake, Stearns County, Minn. California salmon, 1876, 1877, 1878.
Pleasant River, Brownville, Me. Penobscot salmon, 1874.
Plum River. (See tributary: Carroll Creek.)
Plum Tree Run, Wilna, Md. California trout, 1880.
Plymouth County, Mass. (See Bridgewater, Mass.; Duxbury, Mass.; East Bridgewater, Mass.; Marshfield, Mass.; Middleborough, Mass.; North Rochester, Mass.; Plymouth, Mass.; Rochester, Mass.; South Abington, Mass.; South Carver, Mass.; West Scituate, Mass.)
Plymouth, Mass., Halfway Pond. Schoodic salmon, 1876, 1877, 1878.
Plymouth, N. H., Baker's River. California salmon, 1878; California trout, 1880.
Plymouth N. H., Pemigewasset River. California trout, 1880; Penobscot salmon, 1875.
Plymouth, N. H., tributary of Merrimack River. Penobscot salmon.
Plymouth, N. C., Roanoke River. Shad, 1878.
Plymouth River, Iowa. California salmon, 1879.
Pocatapaug Lake, East Hampton, Conn. Schoodic salmon, 1879.
Pocomoke Bay, branch of, Crisfield, Md. California salmon, 1876.
Pocomoke Bay, branch of, Newtown, Md. California salmon, 1876.
Pocomoke City, Md., Pocomoke River. Shad, 1877.
Pocomoke River, Mitchell's Bridge, Md. California salmon, 1878.
Pocomoke River, Newtown, Md. Shad, 1879.
Pocomoke River, Pocomoke City, Md. Shad, 1877.
Pocomoke River, Snow Hill, Md. California salmon, 1878; shad, 1878.
Pocomoke River, Whaleysville, Md. California salmon, 1879, 1880; shad, 1879.

Pohatcong River, N. J. Penobscot salmon, 1875.
Pohatcong River, Bloomsbury, N. J. California salmon, 1874.
Point of Rocks, Md., Potomac River. California salmon, 1875, 1876; shad, 1878, 1879, 1880.
Point Pleasant, Pa., Delaware River. Shad, 1874.
Pokagon Creek, Cass County, Mich. California salmon, 1878, 1879.
Pokagon Creek, Mich. California salmon, 1875, 1878.
Pokagon Creek, Pokagon, Mich. California salmon, 1875.
Pokagon Mich., Dowagiac Creek. Schoodic salmon, 1874.
Pokagon, Mich., Dowagiac River. California salmon, 1875.
Pokagon, Mich., Pokagon Creek. California salmon, 1875.
Pokagon, Mich., State Hatchery Pond. California salmon, 1873, 1875; California trout, 1880.
Polk County, Iowa. (See Des Moines, Iowa.)
Polk County, Minn. (See Crookston, Minn.)
Polk County, Wis. (See Clear Lake, Wis.)
Pollard, Ala., Escambia River. Shad, 1878.
Pollocksville, N. C., Trent River. Shad, 1879.
Pomeroy, Iowa, Des Moines River. California salmon, 1875.
Pomeroy, Iowa, Twin Lakes. California salmon, 1875.
Pomme de Terre River, Stevens County, Minn. California salmon, 1877, 1877, 1877.
Pomme de Terre River. (See tributaries: Foss Lake and Big Stone Lake.)
Pomparaug River. Woodbury, Conn. Schoodic salmon, 1880.
Pontchartrain Lake. (See tributaries: Notalbany River, Amite River, and Tangipahoa River.)
Pontiac, Mich., Clinton River. California salmon, 1876.
Pontiac, Mich., Lord's Lake. California salmon, 1876; Penobscot salmon, 1873.
Pontoosuc Lake, Pittsfield, Mass. Schoodic salmon, 1876, 1877, 1878, 1880.
Pope County, Minn., Lake Peterson. California salmon, 1878.
Pope County, Minn., Chippewa River. California salmon, 1878.
Poplar Bluff, Mo., Big Black River. Shad, 1879.
Poplar Bluff, Mo., Black River. Shad, 1876.
Portage County, Ohio. (See Kent, Ohio.)
Portage Lake, Dexter, Mich. Whitefish, 1876.
Portage River, Elmore, Ohio. California salmon, 1877.
Portage River, Kalamazoo County, Mich. California salmon, 1875.
Portage River, Three Rivers, Mich. California salmon, 1876.
Portage River. (See tributary: Baw Beese Lake.)
Portage, Wis., Silver Lake. California salmon, 1878.
Port Deposit, Md., ponds. California trout, 1880.
Port Deposit, Md., Susquehanna River. Shad, 1879.
Port Huron, Saint Clair County, Mich., Black River. California salmon, 1875.

Port Huron, Saint Clair County, Mich., Saint Clair River. California salmon, 1875.
Potomac River, Cherry Run, Md. California salmon, 1877.
Potomac River, Cumberland, Md. Shad, 1876, 1877, 1880.
Potomac River, East Branch, Washington, D.C. Shad, 1880 (21 items.)
Potomac River, Ferry Landing, Va. Shad, 1875, 1876.
Potomac River, Fort Pendleton, Md. California salmon, 1877, 1880.
Potomac River, Fort Washington, Md. Shad, 1878, 1880.
Potomac River, Freestone, Va. Shad, 1875, 1878.
Potomac River, Glymont, Md. Shad, 1878, 1878.
Potomac River, Harper's Ferry, W. Va. California salmon, 1879.
Potomac River, headwaters of, Md. Shad, 1876.
Potomac River, Jackson City, Va. Shad, 1873, 1875.
Potomac River, Keyser, W. Va. California salmon, 1876, 1878, 1880.
Potomac River, Little Falls, Md. Shad, 1879, 1880, 1880, 1880, 1880.
Potomac River, Md. Penobscot salmon, 1875; shad, 1878.
Potomac River, Moxley Point, Md. Shad, 1875, 1880, 1880, 1880.
Potomac River, North Branch, Fort Pendleton, Md. California salmon, 1876, 1876, 1878, 1878, 1878; Penobscot salmon, 1875.
Potomac River, North Branch, Md. Penobscot salmon, 1880.
Potomac River, North Branch, Swanton, Md. California salmon, 1878.
Potomac River, Piedmont, Md. California salmon, 1877.
Potomac River, Piedmont, W. Va. Shad, 1876, 1879.
Potomac River, Point of Rocks, Md. California salmon, 1875, 1876; shad, 1878, 1879, 1880.
Potomac River, Potomac Point, Md. Shad, 1878.
Potomac River, Sir John's Run, Md. California salmon, 1875, 1877, 1878.
Potomac River, South Branch, Md. Penobscot salmon, 1880.
Potomac River, South Branch, Romney, W. Va. Schoodic salmon, 1879; California salmon, 1876.
Potomac River, South Branch, W. Va. Schoodic salmon, 1879.
Potomac River, tributaries of, Hampshire County, W. Va. California salmon, 1879, 1880, 1880.
Potomac River, tributaries of, Romney, W. Va. California salmon, 1878.
Potomac River, Washington, D. C. Shad, 1878, 1880.
Potomac River, Weaverton Station, Md. California salmon, 1876, 1878, 1878.
Potomac River, W. Va. California salmon, 1878, 1878.
Potomac River. (See tributaries: Antietam Creek, Conococheague River, Evitts Creek, Wills Creek, Savage Creek, North Fork, Owens Creek, Little Lorem, Cedar Creek, South Fork, Goose River, Shenandoah River, and Conecocheague River.)
Pottawattamie County, Iowa. (See Council Bluffs, Iowa.)
Pottawatomie County, Kans. (See Wamego, Kans.)
Potter County, Pa. Schoodic salmon, 1879.
Pottstown, Pa., Schuylkill River. California salmon, 1878.

Poynette, Wis., tributary of Wisconsin River. California salmon, 1878.
Prairie Du Pont River, Belleville, Ill. California salmon, 1876, 1877.
Preston County, W. Va. (See Rowlesburgh, W. Va.)
Preston Lake, Renville County, Minn. California salmon, 1876, 1878, 1879.
Prichard's Run, Marion County, W. Va. Schoodic salmon, 1878.
Prince Edward County, Va. (See Farmville, Va.; Prospect, Va.)
Prince George's County, Md. (See Cedar Point, Md.; Forestville, Md.; Fort Washington, Md.; Laurel, Md.; and Moxley Point, Md.)
Princess Anne, Md., Manokin River. Shad, 1878, 1879.
Prince William County, Va. (See Freestone, Va.; Freestone Point, Va.; Neabsco Mills, Va.)
Prior Lake, Scott County, Minn. California salmon, 1876, 1877, 1878.
Prospect, Va., Appomattox River. California salmon, 1880.
Providence County, R. I., Pawtuxet River. Penobscot salmon, 1875; Shad, 1874, 1875.
Providence County, R. I., Blackstone River. Shad, 1874, 1877.
Providence County, R. I. (See Burrellville, R. I., Foster, R. I.)
Pulaski County, Ark. (See Little Rock, Ark.)
Pulaski County, Ky., Cumberland River. Shad, 1878.
Pulaski County, Ky. (See Somerset, Ky.)
Pulaski County, Va., New River. Schoodic salmon, 1880.
Pulaski County, Va. (See Central, Va.)
Pulaski Lake, Wright County, Minn. California salmon, 1877.
Pushaw Pond, Glenburn, Me. Schoodic salmon, 1879.
Put-in Bay, Ohio, Lake Erie. California salmon, 1877; Penobscot salmon, 1875; Schoodic salmon, 1876.
Putnam, Conn., Thames River. Shad, 1874.
Putnam, Livingston County, Mich., Half Moon Lake. California salmon, 1878.
Putnam, Livingston County, Mich., Patterson Lake. California salmon, 1878.
Putty Lake, Kalamazoo County, Mich. California salmon, 1875.
Quactuto River, Arkadelphia, Ark. California salmon, 1878, 1878, 1878.
Quamapowitt Lake, Wakefield, Mass. Schoodic salmon, 1877, 1878, 1879.
Quasepaug Lake, Middlebury, Conn. Schoodic salmon, 1880.
Queen Anne County, Md. (See Centreville, Md.)
Queen's County, N. Y., tributary of Long Island Sound. California salmon, 1874.
Queen's County, N. Y. (See Roslyn, N. Y.)
Quinnebaug River, Canterbury, Conn. Shad, 1875.
Quinnepiac River, Conn. California salmon, 1874.
Quobaug Pond, Palmer, Mass. Penobscot salmon, 1874.
Racine County, Wis., Brown's Lake. California salmon, 1877, 1879.
Raccoon Creek, Gloucester County, N. J. California salmon, 1879.

Raccoon Creek, N. J. California salmon, 1877.
Raccoon River, Iowa. California salmon, 1875, 1878.
Raisin Centre, Mich., Southard's Lake. California salmon, 1878.
Raisin River, Brooklyn, Mich. California salmon, 1875.
Raisin River, Monroe, Mich. California salmon, 1875, 1879; shad, 1873.
Raisin River, Somerset, Mich. California salmon, 1875.
Raisin River, tributaries of, Lenawee County, Mich. California salmon, 1875.
Raisin River. (See tributaries: Palmyra Pond and Southard's Lake.)
Raleigh, N. C., Neuse River. Shad, 1877, 1878, 1879.
Raleigh, N. C., ponds. California salmon, 1879.
Ralston, Pa., Trout River. Penobscot salmon, 1880.
Ramsey County, Minn., Bald Eagle Lake. California salmon, 1876.
Ramsey County, Minn., Bass Lake. California salmon, 1875; Penobscot salmon, 1875; Schoodic salmon, 1875.
Ramsey County, Minn., Big Butts Lake. California salmon, 1876.
Ramsey County, Minn., Como Lake. California salmon, 1875, 1876, 1877; Penobscot salmon, 1875; Schoodic salmon, 1875.
Ramsey County, Minn., Gervais Lake. California salmon, 1878.
Ramsey County, Minn., Halloran Lake. California salmon, 1876.
Ramsey County, Minn., Johanna Lake. California salmon, 1875, 1876, 1877; Penobscot salmon, 1875; Schoodic salmon, 1875.
Ramsey County, Minn., Josephine Lake. California salmon, 1876, 1876, 1877.
Ramsey County, Minn., Kingsley Lake. California salmon, 1876.
Ramsey County, Minn., Krameroth Pond. California salmon, 1878.
Ramsey County, Minn., Little Butts Lake. California salmon, 1876.
Ramsey County, Minn., McCann's Lake. California salmon, 1876, 1877.
Ramsey County, Minn., McCannis Lake. Schoodic salmon, 1878.
Ramsey County, Minn., Phalon Lake. California salmon, 1876, 1877.
Ramsey County, Minn., Rice's Pond. California salmon, 1877; Schoodic salmon, 1878.
Ramsey County, Minn., Saint Croix River. California salmon, 1875, 1875, 1875, 1875.
Ramsey County, Minn., Turtle Lake. California salmon, 1876.
Ramsey County, Minn., Vadnais Lake. California salmon, 1876.
Ramsey County, Minn., White Bear Lake. California salmon, 1875, 1876; Penobscot salmon, 1875; Schoodic salmon, 1875, 1877.
Ramsey County, Minn. (See Saint Paul, Minn.)
Randolph County, W. Va., Tygert's Valley River. California salmon, 1879, 1880.
Randolph County, W. Va., tributaries of Tygart's Valley River. Schoodic salmon, 1878.
Rapid Ann River, Rapid Ann Station, Va. California salmon, 1878, 1879.
Rapid Ann Station, Va., Rapid Ann River. California salmon, 1878, 1879.

Rapid River, Kalkaska County, Mich. California salmon, 1876.
Rappahannock River, tributary of, Va. California salmon, 1876.
Rappahannock River. (See tributary: Rapid Ann River.)
Raritan, N. J., Pattenburgh Creek. California salmon, 1874.
Raritan River, North Branch, Somerset County, N. J. California salmon, 1879.
Raritan River, South Branch of, South Branch, N. J. Penobscot salmon, 1875.
Raritan River. (See tributaries: Pattenburgh Creek, Salmon Run, and South Branch of Raritan River.)
Raritan River, tributary of, N. J. California salmon, 1874, 1875; Penobscot salmon, 1874.
Raymond, N. H., Jones Pond. Schoodic salmon, 1879.
Reading, Kans., Marais des Cygnes River. Shad, 1879; California salmon, 1881.
Reading, Pa., Schuylkill River. California salmon, 1875, 1878.
Rebecca Lake, Hennepin County, Minn. California salmon, 1878.
Rectorstown, Va., Goose Creek. California salmon, 1876.
Red Brook, Mass. California salmon, 1876.
Red Brook, tributary of, Mass. Penobscot salmon, 1873.
Red Brook. (See tributary: Quobaug.)
Red Cedar River. (See tributary: Fish Lake.)
Reading, Kans., Osage River. California salmon, 1878, 1879.
Redding, Cal., tributary of Sacramento River. Penobscot salmon, 1874.
Red Lake River, tributary of, Crookston, Minn. California salmon, 1880.
Red River, Fulton, Ark. Shad, 1877, 1879.
Red River of the North, Breckenridge, Minn. California salmon, 1875; Penobscot salmon, 1875; Schoodic salmon, 1875.
Red River of the North, Moorhead, Minn. California salmon, 1877.
Red River of the North. (See tributaries: Buffalo River, Detroit Lake, and Perham.)
Red River of the North, Wilkin County, Minn. California salmon, 1878.
Red Vermillion River, Centralia, Kans. California salmon, 1878, 1879.
Red Wing, Minn., Mississippi River. California salmon, 1876.
Red Wing, Minn., Skillman Pond. California salmon, 1877; Schoodic salmon, 1877.
Reed City, Mich., Hersey Creek. California salmon, 1874.
Reed Creek, Wythe County, Va. California salmon, 1879.
Reed Lake, Grand Rapids, Mich. California salmon, 1876.
Reed's Pond, Marshall County, Mich. Schoodic salmon, 1876.
Reese Pond, Calhoun County, Mich. Schoodic salmon, 1876.
Reisterstown, Md, lake tributary to Patapsco Falls. Schoodic salmon, 1879.
Reisterstown, Md., pond. Schoodic salmon, 1878.
Relay Station, Baltimore County, Md., Patapsco River. Shad, 1879.

Reno County, Kans. (See Hutchinson, Kans.)
Reno, Nev., Truckee River. California salmon, 1879.
Renville County, Minn., Lake Alley. California salmon, 1879; Schoodic salmon, 1879.
Renville County, Minn., Preston Lake. California salmon, 1876, 1879; Schoodic salmon, 1879.
Republican River, Clay Centre, Kans. California salmon, 1880.
Republican River, Clifton, Kans. California salmon, 1880.
Republican River, Concordia, Kans. California salmon, 1878, 1879; California trout, 1880.
Republican River, Davis County, Kans. Shad, 1879.
Republican River, Junction City, Kans. California salmon, 1878, 1879.
Resaca, Ga., Coosa River. California salmon, 1878; shad, 1879.
Reservoir, Richmond, Va. California salmon, 1879.
Reservoir, West Hartford, Conn. Schoodic salmon, 1879.
Rice County, Minn., Barry Hunt's Lake. Penobscot salmon, 1875.
Rice County, Minn. California salmon, 1876.
Rice County, Minn., Cannon River. California salmon, 1878.
Rice County, Minn., Cameron River. California salmon, 1875; Schoodic salmon, 1879.
Rice County, Minn., Cedar Lake. California salmon, 1875, 1876, 1877, 1878; Penobscot salmon, 1875; Schoodic salmon, 1879.
Rice County, Minn., Circle Lake. California salmon, 1878.
Rice County, Minn., Dudley Lake. California salmon, 1876, 1878; Penobscot salmon, 1875.
Rice County, Minn., Faribault Lake. Penobscot salmon, 1875; Schoodic salmon, 1875.
Rice County, Minn., French Lake. California salmon, 1876, 1877, 1878.
Rice County, Minn., Gillmore's Creek. California salmon, 1878.
Rice County, Minn., Horse Shoe Lake. California salmon, 1878.
Rice County, Minn., Jackson Lake. Penobscot salmon, 1875.
Rice County, Minn., lake. California salmon, 1876; Penobscot salmon, 1875.
Rice County, Minn., Minnesota River. California salmon, 1875.
Rice County, Minn., Northfield Lake. Schoodic salmon, 1875, 1878.
Rice County, Minn., Roberts Lake. California salmon, 1876, 1877, 1878; Penobscot salmon, 1875; Schoodic salmon, 1879.
Rice County, Minn., Shields Lake. California salmon, 1876, 1878.
Rice County, Minn., Spring Creek. California salmon, 1878.
Rice County, Minn., Union Lake. California salmon, 1878.
Rice County, Minn. (See Faribault, Minn.; Northfield, Minn.)
Rice's Pond, Ramsey County, Minn. California salmon, 1877; Schoodic salmon, 1878.
Rich County, Utah, Upper Bear River. California salmon, 1876, 1876.
Richfield, Wis., Cedar Creek. California salmon, 1879.
Richland Centre, Wis., Pine River. California salmon, 1877.

Richland County, La., Bayou Mason. Shad, 1879.
Richland County, La., Bœuf River. Shad, 1879.
Richland County, S. C., Wateree River. Shad, 1880; California salmon, 1880.
Richland County, S. C. (See Columbia, S. C.)
Richland, Mich., Gull Lake. California salmon, 1878.
Richland, Mich., Long Lake. California salmon, 1878.
Richland, Mich., Parker Lake. Schoodic salmon, 1876.
Richmond, McHenry County, Ill., Twin Lakes. Schoodic salmon, 1878.
Richmond, Washington County, R. I., Beach Pond. Schoodic salmon, 1876.
Richmond, Va., James River. Shad, 1878.
Richmond, Va., Reservoir. California salmon, 1879.
Ridgefield, Conn., Round Pond. Schoodic salmon, 1879.
Rifle River, Crawford, Mich. California salmon, 1876.
Rifle River, Bay County, Mich. California salmon, 1875.
Riley County, Kans. (See Manhattan, Kans.)
Rindge, N. H., Emerson Pond. Schoodic salmon, 1880.
Ringwood, N. J., Shepherd's Lake. Schoodic salmon, 1879.
Ripley County, Mo. (See Doniphan, Mo.)
Ripley, Miss., Tippah River. Shad, 1879.
Ripley Lake, Meeker County, Minn. California salmon, 1877.
Ritchie County, W. Va. (See Pennsborough, W. Va.)
Rivanna River, Shadwell, Va. Shad, 1878.
Riverton, Va., Shenandoah River. Shad, 1878.
Roanoke County, Va. (See Salem, Va.)
Roanoke River, Alleghany Springs, Va. California salmon, 1880.
Roanoke River, Big Spring Depot, Va. California salmon, 1880.
Roanoke River Light, N. C. (See Avoca, N. C.)
Roanoke River, Montgomery, White Sulphur Springs, Va. California salmon, 1880.
Roanoke River, Plymouth, N. C. Shad, 1878.
Roanoke River, Salem, Va. California salmon, 1880; shad, 1878.
Roanoke River, tributary of, Salem, Va. California salmon, 1874.
Roanoke River, tributary of, Va. California salmon, 1876.
Roanoke River, Weldon, N. C. Shad, 1878, 1879, 1879, 1879.
Roanoke River. (See tributaries: Town Creek, Staunton River, and Dan River.)
Roberts Lake, Northfield, Minn. California salmon, 1877.
Roberts Lake, Rice County, Minn. California salmon, 1876, 1877, 1878; Penobscot salmon, 1875; Schoodic salmon, 1879.
Robertson County, Tex. (See Hearne, Tex.)
Robeson County, N. C. (See Branchville, N. C.)
Rochester, Mass., Mary's Pond. Schoodic salmon, 1879, 1880.
Rochester, Mich., private pond. California salmon, 1878.
Rochester, Minn., Orono River. California salmon, 1877.

Rochester, Minn., South Branch of Zumbro River. California salmon, 1877.
Rockaway River, Dover, N. J. Penobscot salmon, 1875.
Rockaway River, Somerset County, N. J. California salmon, 1879.
Rockbridge County, Va., Buffalo Creek. Schoodic salmon, 1877.
Rockbridge County, Va., Irish Creek. Schoodic salmon, 1877.
Rockbridge County, Va., tributary of James River. California salmon, 1876.
Rockbridge County, Va. (See Alone, Va.; Buffalo Mills, Va.; Collierstown, Va.; Kerr's Creek Bridge, Va.; Lexington, Va.; Monmouth Church, Va.)
Rockcastle County, Ky., Hardin Durham's Branch. California salmon, 1877.
Rockcastle County, Ky., Round Stone Creek. California salmon, 1877.
Rock Church, Cecil County, Md., Little Elk River. California salmon, 1878.
Rock County, Wis., Janesville, Wis., Milton, Wis.
Rock Creek, Rockville, Md. California trout, 1880.
Rockdale County, Ga. (See Conyers, Ga.)
Rockford, Ill., Rock River. California salmon, 1874, 1875, 1879; shad, 1874, 1875, 1878.
Rockford, Ill., Kent's Creek. California salmon, 1877.
Rock Hill, S. C., Catawba River. Shad, 1880.
Rockingham County, N. H. (See Raymond, N. H.)
Rockingham County, N. C., Moyo River. Schoodic salmon, 1878.
Rockingham, Vt., Saxton River. Penobscot salmon, 1874.
Rockingham County, Va. (See Burnt Bridge, Va.)
Rock Pond, Georgetown, Mass. Schoodic salmon, 1877.
Rock River, Rockford, Ill. California salmon, 1874, 1875, 1879; shad, 1874, 1875, 1878.
Rock River, tributaries of, Ill. California salmon, 1876, 1877.
Rock River. (See tributaries: Madison Lake, Sugar River, Pecatonica River, Knapp's Creek, Brown's Creek, Kent's Creek.)
Rockville, Conn., Snipsic Lake. Schoodic salmon, 1876, 1877, 1878, 1879.
Rockville, Md., Rock Creek. California trout, 1880.
Rocky Mount, N. C., Tar River. Shad, 1879, 1879.
Rocky Run, Md. California trout, 1880.
Rogers Lake, Lyme, Conn. Schoodic salmon, 1876, 1878, 1880.
Rogers Pond, Branford, Conn. Schoodic salmon, 1877.
Rogers River, Wayne County, Mich. California salmon, 1879.
Roland Lake, pond tributary to, Green Spring, Md. California trout, 1880; Schoodic salmon, 1880.
Rolling Fork, North and East Forks of, Marion County, Ky. California salmon, 1877.
Rolling Fork of Salt River, Nelson County, Ky. California salmon, 1877.

Rome City, Ind. Rome City Lake. Whitefish, 1876.
Rome City Lake, Rome City, Ind. Whitefish, 1876.
Rome, Ga., Coosa River. Shad, 1875.
Ro . e, N. Y., Mohawk River. Penobscot salmon, 1875.
Romeo, Mich., private ponds. California salmon, 1879.
Romney, W.Va., Mill Run. California trout, 1880.
Romney, W.Va., Pond at Institution for Deaf, &c. Schoodic salmon, 1879, 1879.
Romney, W. Va., South Branch of Potomac River. Schoodic salmon, 1879.
Romney, W. Va., South Fork of Potomac River. California salmon, 1876.
Ronceverte, W. Va., Greenbrier River. California salmon, 1878, 1879, 1880; shad, 1873, 1879.
Roney Lake, Clare County, Mich. Schoodic salmon, 1878.
Roosevelt Creek, Sayville, N. Y. California salmon, 1874.
Root River, Olmstead County, Minn. California salmon, 1877, 1877.
Root River, Middle Branch of, Fillmore County, Minn. California salmon, 1878.
Root River, tributary of, Lanesborough, Minn. California salmon, 1876.
Root River, tributary of, Pilot Mound, Minn. California salmon, 1878.
Root River, tributary of, Spring Valley, Minn. California salmon, 1878.
Root River, North Branch of, Fillmore County, Minn. California salmon, 1878, 1878.
Root River, South Branch of, Fillmore County, Minn. California salmon, 1878.
Roscommon County, Mich., Au Sable River. Penobscot salmon, 1873.
Roscommon County, Mich., Higgins Lake. California salmon, 1879; Penobscot salmon, 1874; Schoodic salmon, 1880.
Rose Lake, Le Roy, Mich. Whitefish, 1876.
Roslyn, N. Y., streams. California salmon, 1876, 1877.
Ross, Mich., lake tributary to Kalamazoo River. California salmon, 1873.
Rouge River, Dearborn, Mich. California salmon, 1875.
Rouge River, Northville, Mich. California salmon, 1876; Schoodic salmon, 1878; whitefish, 1876, 1876, 1876.
Rouge River, Oakland County, Mich. California salmon, 1875.
Rouge River. (See tributary: Yerkes Lake.)
Rough Creek, Hardin County, Ky. California salmon, 1877.
Roundaway Creek, R. R. crossing, Madison County, La. Shad, 1879.
Round Lake, Anoka County, Minn. California salmon, 1877, 1877.
Round Lake, Chelsea, Mich. Whitefish, 1876.
Round Lake, Chenango County, N. Y. California salmon, 1874.
Round Lake, Clinton County, Mich. California salmon, 1875.
Round Lake, Linden, Mich. Whitefish, 1876.
Round Lake, Noble County, Minn. California salmon, 1880.
Round Lake, Oceana County, Mich. California salmon, 1879.

Round Lake, Petosky, Mich. Whitefish, 1876.
Round Lake, Washington County, Minn. California salmon, 1876.
Round Pond, Ridgefield, Conn. Schoodic salmon, 1879.
Round Stone Creek, Rockcastle County, Ky. California salmon, 1877.
Rowan County, N. C., Yadkin River. Shad, 1877.
Rowan County, N. C. (See Salisbury, N. C.)
Rowlandville, Md., Octorora Creek. California salmon, 1876.
Rowlesburgh, W. Va., Cheat River. Shad, 1879.
Royalton, Vt., White River. Penobscot salmon, 1874.
Rush Creek, Fillmore County, Minn. California salmon, 1878.
Rush Lake, Chisago County, Minn. California salmon, 1877.
Rush Lake, Sherburne County, Minn. California salmon, 1878.
Russell Creek, Adair County, Ky. California salmon, 1876.
Rutland County, Vt. (See Castleton, Vt.; Hubbardton, Vt.)
Sabine River, Mineola, Tex. Shad, 1879.
Sacramento River, Tehama, Cal Shad, 1873, 1876, 1877, 1878, 1880.
Sacramento River, tributary of, Redding, Cal. Penobscot salmon, 1874.
Sacramento River, tributary of, San Francisco, Cal. California salmon, 1876.
Sacramento River. (See tributary: McCloud River.)
Saginaw County, Mich., Cass River. California salmon, 1879.
Saginaw River. (See tributaries: Flint River, Tattabawassee River, and Cass River.)
Saint Clair County, Ill. (See Belleville, Ill.)
Saint Clair County, Mich. (See Port Huron, Mich.)
Saint Clair Lake. (See tributaries: Clinton River, Lord's Lake, Black River, Orchard Lake, Wall's Lake, Whitmore Lake, Gun Lake, Barrier's Lake, and Diamond Lake.)
Saint Clair River, Port Huron, Mich. California salmon, 1875.
Saint Croix River, Chisago County, Minn. California salmon, 1875, 1875.
Saint Croix River, Ramsey County, Minn. California salmon, 1875, 1875, 1875.
Saint Croix River, Stillwater, Minn. California salmon, 1876.
Saint Croix River, tributary of, Me. Penobscot salmon, 1873.
Saint Croix River, tributaries of, Pine City, Minn. California salmon, 1877.
Saint Croix River. (See tributaries: Keen's Lake Stream, Schoodic Lakes, Silver Lake, and Elmo Lake.)
Saint Francis River, Arcadia, Mo. Shad, 1879.
Saint Francis River, Wayne County, Mo. California salmon, 1879.
Saint Genevieve County, Mo. (See Saint Mary's, Mo.)
Saint James Lake, Watonwan County, Minn. California salmon, 1877.
Saint James, Md., pond. California trout, 1880.
Saint Johnsbury, Vt., small ponds tributary to Connecticut River. Schoodic salmon, 1878.

Saint John's Lake, Stearns County, Minn. California salmon, 1878.
Saint Joseph County, Mich. (See Colon, Mich.; Three Rivers, Mich.)
Saint Joseph, Mich., North Branch Saint Joseph's River. Penobscot salmon, 1873.
Saint Joseph, Mich., ponds. California salmon, 1875, 1878.
Saint Joseph, Mo., Missouri River. Shad, 1877; California salmon, 1880.
Saint Joseph River, Elkhart, Ind. Shad, 1874.
Saint Joseph River, headwaters of, Hillsdale County, Mich. Penobscot salmon, 1873.
Saint Joseph River, Niles, Mich. California salmon, 1875; shad, 1873.
Saint Joseph River, North Branch, Mich. Penobscot salmon, 1873, 1873, 1873.
Saint Joseph River, Three Rivers, Mich. California salmon, 1876.
Saint Joseph River, tributaries of, Mich. Penobscot salmon, 1873.
Saint Joseph River. (See tributaries: Butternut Creek, Sand Creek, Portage River, Indian Lake, Cold Water Lake, Lake of the Woods, Morrison Lake, Barrow Lake, Muncy Lake, Diamond Lake, Sturgeon Lake, Indian Creek, Dowagiac River, Williams Creek, Pearine Creek, Pokagon Creek, Miller Creek.)
Saint Louis County, Minn., Fond du Lac. Schoodic salmon, 1875.
Saint Louis County, Minn. (See Duluth, Minn.; Fond du Lac, Minn.)
Saint Louis County, Mo. (See Saint Louis, Mo.)
Saint Louis, Mo., Mississippi River. Shad, 1877, 1878.
Saint Louis River, Fond du Lac, Minn. California salmon, 1878.
Saint Louis River, Pine County, Minn. California salmon, 1875, 1875.
Saint Malachy's Lake, Swift County, Minn. California salmon, 1877.
Saint Marks, Cecil County, Md., Big Elk River. California salmon, 1879.
Saint Mary's, Mo., Saline River. California salmon, 1879.
Saint Mary's Lake, Swift County, Minn. California salmon, 1877.
Saint Mary's River, tributary of, Mich. Penobscot salmon, 1874.
Saint Michael's River, Berlin, Md. Shad, 1879.
Saint Paul and Pacific Railroad Streams, Minn. California salmon, 1876.
Saint Paul, Minn., Mississippi River. Shad, 1872, 1874, 1877.
Saint Peter, Minn., Minnesota River. Penobscot salmon, 1875.
Salamanca, N. Y., Allegheny River. Shad, 1872.
Salem, Conn., Gardiner's Lake. Schoodic salmon, 1876, 1877, 1878, 1879.
Salem County, N. J. (See Allowaystown, N. J.; Woodstown, N. J.)
Salem Creek, Woodstown, N. J. California salmon, 1876.
Salem, Mass., Suntaug Lake. Schoodic salmon, 1878.
Salem, Mass., Wenham Lake. Schoodic salmon, 1878.
Salem, Va., Lake Spring. Schoodic salmon, 1880.
Salem, Va., Roanoke River. California salmon, 1880; shad, 1878.
Salem, Va., tributary of Roanoke River. California salmon, 1874.
Salina, Kans., Saline River. California salmon, 1878, 1879, 1880.

Saline County, Ark., Saline River. Shad, 1879.
Saline County, Ark. (See Benton, Ark.)
Saline County, Kans., Solomon River. Shad, 1879.
Saline County, Kans. (See Brookville, Kans.; Salina, Kans.)
Saline River, Benton, Ark. Shad, 1878; California salmon, 1878, 1878.
Saline River, Saint Mary, Mo. California salmon, 1879.
Saline River, Saline County, Ark. Shad, 1879.
Saline River, Salina, Kans. California salmon, 1878, 1879, 1880.
Salisbury, Ala., Tallapoosa River. Shad, 1878.
Salisbury, Bucks County, Pa., Aquetong Lake. Schoodic salmon, 1878.
Salisbury, Conn., Twin Lakes. Schoodic salmon, 1877, 1878.
Salisbury, Md., Wicomico River. California salmon, 1879, 1879, 1880, 1880; shad, 1877, 1878, 1879.
Salisbury, N. C., Yadkin River. California salmon, 1877, 1877, 1879.
Salisbury, Rowan County, N. C., ponds tributary to Yadkin River. Schoodic salmon, 1878; shad, 1878, 1879.
Salisbury, Vt., Dunmore Lake. Schoodic salmon, 1876.
Salmon Creek, Avoca, N. C. Shad, 1878, 1878, 1879, 1879.
Salmon Creek, Mich. Penobscot salmon, 1874.
Salmon Creek, The Mill, N. C. Shad, 1878.
Salmon Falls River. (See tributary: Newechewaurrock Lake, Tri Echo Lake, Lorewell's Pond, Cook's Pond.)
Salmon Lake, Cass County. California salmon, 1879.
Salmon River, Granby, Conn. Schoodic salmon, 1880.
Salmon River, N. Y. California salmon, 1873.
Salmon River, N. Y. Penobscot salmon, 1873.
Salmon River, Peru, N. Y. Penobscot salmon, 1875.
Salmon River, Sand Bank, N. Y. California salmon, 1874.
Salmon Run, N. J. Penobscot salmon, 1873.
Salmon Stream, Me. Penobscot salmon, 1874, 1875.
Salt Creek, Mexico, Mo. Shad, 1877.
Salt Lake. (See tributaries: Jordan River, Ogden and Weber Rivers, and Upper Bear River.)
Salt Lake County, Utah. (See Jordan, Utah.)
Saltonstall Lake, East Haven, Conn. Schoodic salmon, 1877, 1878, 1879.
Salt River, Shelby County, Mo. California salmon, 1880; shad, 1880.
Salt River, Shepherdsville, Ky. Shad, 1879, 1880.
Saltville, Va., North Fork, Holstein. Schoodic salmon, 1880.
Saluda River, Greenville, S. C. California salmon, 1880.
Saluda River, S. C. California salmon, 1880.
Sampson County, N. C., Six Runs. Shad, 1877.
Sampson County, N. C. (See Six Runs, N. C.)
San Antonio River, San Antonio, Tex. Shad, 1879.
San Antonio, Tex., San Antonio River. Shad, 1879.
Sand Bank, N. Y., Beaver Creek. California salmon, 1874.

Sand Bank, N. Y., Salmon River. California salmon, 1874.
Sand Creek, Hillsdale County, Mich. California salmon, 1873.
Sand Lake, Ill., Deep Lake. California salmon, 1876.
Sandstone Creek, Mich. California salmon, 1874.
Sandusky County, Ohio. (See Fremont, Ohio.)
Sandusky River, Bucyrus, Ohio. California salmon, 1874.
Sandusky River, Fremont, Ohio. California salmon, 1880; Penobscot salmon, 1875; Schoodic salmon, 1876; shad, 1874, 1878, 1879, 1880.
Sandwich, Mass., Spectacle Pond. Schoodic salmon, 1876, 1877, 1880.
Sandwich, N. H., Adams' Pond. Schoodic salmon, 1880.
Sandwich, N. H., North Pond. Schoodic salmon, 1880.
Sandwich, N. H., pond. Schoodic salmon, 1879.
Sandy Branch, Cecil County, Md., Sassafras River. California salmon, 1879.
Sandy Creek, Orleans County, N. Y. California salmon, 1874.
Sandy Hook, Conn., Halfway River. Schoodic salmon, 1880.
Sandy Lake, Cass County, Minn. Schoodic salmon, 1879.
Sandy Pond, Lincoln, Mass. Schoodic salmon, 1876, 1877.
Sandy Spring, Md., pond. California salmon; Schoodic salmon, 1880.
Sandy Spring, Md., stream. California trout, 1880.
Sandy Spring, Md., pond. Schoodic salmon, 1880.
San Francisco, Cal., Laguna Honda. Schoodic salmon, 1878.
San Francisco, Cal., tributary of Sacramento River. California salmon, 1876.
San Francisco, Cal., Woodward's Aquarium. Schoodic salmon, 1878.
San Francisco County, Cal. (See San Francisco, Cal.)
San Jose Water Co's Reservoir, Cal. Whitefish, 1879.
San Marcus River, Luling, Tex. Shad, 1879.
San Mateo County, Cal., Felch's Lake. Schoodic salmon, 1878.
Santa Clara County, Cal., San Jose Water Company's Reservoir. Whitefish, 1879.
Santee River. (See tributaries: Broad River, Catawba River, Broad River, and Saluda River.)
Sappington, Anne Arundel County, Md., tributary of Patuxent River. 1879.
Sequoit Creek, N. Y. California salmon, 1874.
Saranac River, West Plattsburgh, N. Y. Penobscot salmon, 1875.
Sassafras River, Cecil County, Md. California salmon, 1880.
Sassafras River, Frederick, Md. California salmon, 1876.
Sassafras River, Md. Shad, 1877.
Sassafras River, Middletown, Md. Shad, 1879.
Sassafras River, Sandy Branch, Md. California salmon, 1879.
Satucket River, East Bridgewater, Mass. Schoodic salmon, 1877, 1878.
Saugatuck River, Conn. California salmon, 1876.
Saugatuck River, Westport, Conn. Penobscot salmon, 1875.
Saugatuck River. (See tributary: Main River.)

Saugus River, Mass. California salmon, 1876, 1877.
Sauk County, Wis., Spirit Lake. California salmon, 1877.
Sauk Lake, Todd County, Minn. California salmon, 1877.
Sauk River, Stearns County, Minn. California salmon, 1877.
Sauk River. (See tributaries: Osakin Lake and Pearl Lake.)
Saunders' Spring Branch, Scott County, Ky. California salmon, 1876.
Sautaug Lake, Lynnfield, Mass. Schoodic salmon, 1879.
Savage Creek, Franklinville, Md. California salmon, 1874.
Savage, Md., Middle Patuxent River. California salmon, 1878, 1878, 1878, 1879.
Savage, Md., Patuxent River. California salmon, 1880; shad, 1879, 1880 (5 items).
Savage, Md., Little Patuxent River. California salmon, 1875, 1876, 1876, 1876.
Savage, Md., Patuxent River. California salmon, 1874, 1876, 1879.
Savage River, Swanton, Md. California salmon, 1877.
Savannah River, tributary of, Toca, Ga. California salmon, 1877.
Savannah River. (See tributary: Tugaloo River.)
Saxton River, Rockingham, Vt. Penobscot salmon, 1874.
Sayville, N. Y., Roosevelt Creek. California salmon, 1874.
Sayville, N. Y., Willow Brook. California salmon, 1876, 1877.
Scantic River, Windsor, Conn. Schoodic salmon, 1880.
Schell City, Mo., Osage River. California salmon, 1880; shad, 1880.
Schoodic Lakes, Dobsis Stream, Me. Penobscot salmon, 1874.
School Section, Washington County, Minn. California salmon, 1876.
Schuylkill County, Pa., Schuylkill River. Schoodic salmon, 1878.
Schuylkill County, Pa. (See Swatara, Pa.)
Schuylkill River, Philadelphia, Pa. California salmon, 1877.
Schuylkill River, Pottstown, Pa. California salmon, 1878.
Schuylkill River, Reading, Pa. California salmon, 1875, 1878.
Schuylkill River, Schuylkill County, Pa. Schoodic salmon, 1878.
Scintman's Mill, Cecil County, Md., Big Elk River. California salmon, 1878, 1880.
Scioto River, Columbus, Ohio. Shad, 1875, 1876.
Scioto River. (See tributary: Licking Reservoir.)
Scituate Ponds, West Scituate, Mass. Schoodic salmon, 1879, 1879.
Scotch Hall Fishery, N. C. (See Avoca, N. C.)
Scott County, Iowa. (See Big Rock, Iowa; Dixon, Iowa.)
Scott County, Ky., Big Spring Branch. California salmon, 1876.
Scott County, Ky., Elkhorn Creek. Shad, 1878.
Scott County, Ky., Cane's Run. California salmon, 1876.
Scott County, Ky., Lane's Run. California salmon, 1876.
Scott County, Ky., McConnell's Run. California salmon, 1876.
Scott County, Ky., Saunders' Spring Branch. California salmon, 1876.
Scott County, Ky., Thomas' Spring Branch. California salmon, 1876.
Scott County, Minn., Credit Lake. California salmon, 1878.

Scott County, Minn., lake. California salmon, 1876.
Scott County, Minn., O'Dowd's Lake. California salmon, 1877, 1878.
Scott County, Minn., Prior Lake. California salmon, 1876, 1877, 1877, 1877, 1878.
Scott County, Minn., Spring Lake. California salmon, 1878.
Scranton, Pa., Paupock Lake. Schoodic salmon, 1879.
Scranton, Pa., Tobyhanna Lake. Schoodic salmon, 1879.
Seaford, Del., Little Nanticoke River. California salmon, 1880.
Seaford, Del., Nanticoke River. California salmon, 1876, 1878, 1880; shad, 1877, 1879, 1880.
Searle's Pond, Foster, R. I. Schoodic salmon, 1876.
Sebec Lake, Me. Penobscot salmon, 1874.
Seboois River, Howland, Me. Penobscot salmon, 1875.
Seboois River, Howland, Me. Penobscot salmon, 1874.
Seboois River, Whitney Ridge, Me. Penobscot salmon, 1874.
Seguin, Tex., Guadalupe River. Shad, 1879.
Seneca, S. C., Seneca River. California salmon, 1878; shad, 1880.
Seneca County, N. Y., Seneca Lake. California salmon, 1874.
Seneca Lake, Seneca County, N. Y. California salmon, 1874.
Seneca River, Seneca, S. C. California salmon, 1878; shad, 1880.
Seneca River, S. C. California trout, 1880; California salmon, 1880, 1880; Schoodic salmon, 1880.
Sequoit Creek, Oneida County, N. Y. California salmon, 1875.
Sereno Lake, Nevada County, Cal. Schoodic salmon, 1878.
Sereno Lake, Placer County, Cal. Schoodic salmon, 1878.
Sereno Lake, Summit, Placer County, Cal. Whitefish, 1877.
Severance's Ponds, Wis. California salmon, 1879.
Seymour Lake, Morgan, Vt. Schoodic salmon, 1876.
Shadwell, Va., Rivanna River. Shad, 1878.
Shady Oak Lake, Minn. California salmon, 1877.
Sharon, Mass., ponds. Schoodic salmon, 1880.
Sharon Springs, Va., North Fork Holston River. California salmon, 1880.
Sharon's Run, Northeast, Md. California salmon, 1880.
Shasta County, Cal. (See Baird, Cal.; Redding, Cal.)
Shawano County, Wis. (See Keshena, Wis.)
Shawnee County, Kans. (See Silver Lake, Kans.; Topeka, Kans.)
Shawngum Lake, N. J. California salmon, 1879.
Shawshine River, Billerica, Mass. Schoodic salmon, 1877.
Sheboygan County, Wis., Elkhart Lake. Penobscot salmon, 1875.
Shelby County, Ky., Clear Creek. California salmon, 1876.
Shelby County, Ky., Gist Creek. California salmon, 1876.
Shelby County, Ky., Salt River. Shad, 1880.
Shelby County, Ohio. (See Sidney, Ohio.)
Shelby County, Tenn. (See Memphis, Tenn.)
Shell Rock River, Iowa. California salmon, 1878.

Shenandoah County, Va. (See Mount Jackson, Va.; Strasburgh, Va.).
Shenandoah River, North Fork of, Mount Jackson, Va. California salmon, 1876.
Shenandoah River, North Fork of, Strasburgh, Va. California salmon, 1876.
Shenandoah River, Riverton, Va. Shad, 1878.
Shenandoah River, South Branch of, Va. Schoodic salmon, 1877.
Shenandoah River. (See tributaries: Cedar Creek, North Fork, and South River.)
Shepherd's Lake, Ringwood, N. J. Schoodic salmon, 1879.
Shepherd's Pond, Morris County, N. J. Whitefish, 1876.
Shepherdsville, Ky., Salt River. Shad, 1879, 1880.
Sheppard's Brook, Battle Creek, Mich. California trout, 1880.
Sherburne County, Minn., Big Lake. California salmon, 1876.
Sherburne County, Minn., Briggs' Lake. California salmon, 1877, 1878.
Sherburne County, Minn., Clear Lake. California salmon, 1877.
Sherburne County, Minn., Hand Lake. California salmon, 1876.
Sherburne County, Minn., Lake Julia. California salmon, 1878.
Sherburne County, Minn., Rush Lake. California salmon, 1878.
Sherman, Conn., Green Pond. Schoodic salmon, 1878, 1879.
Sherman, Conn., Square Pond. Schoodic salmon, 1878.
Shetucket River, Conn. California salmon, 1874.
Shetucket River, Willimantic, Conn. Penobscot salmon, 1875.
Shetucket waters, Windham, Conn. Schoodic salmon, 1876.
Shiawassee County, Mich. (See Corunna Mich.; Owosso, Mich.)
Shiawassee River, Corunna, Mich. Shad, 1874.
Shiawassee River, Holly, Mich. California salmon, 1876.
Shiawassee River, Owasso, Mich. California salmon, 1875.
Shields Lake, Rice County, Minn. California salmon, 1876, 1878.
Shoal Creek, Neosha, Mo. Shad, 1878.
Shoemaker's Eddy, Shoemaker's, Pa., Delaware River. California salmon, 1878, 1879, 1880 (11 items).
Sibley County, Minn., Silver Lake. California salmon, 1877; Penobscot salmon, 1879.
Sibley County, Minn., Horseshoe Lake. California salmon, 1877.
Sidney, Ohio, Little Miami River. California salmon, 1875.
Silver Creek, Madison County, Ky. California salmon, 1876.
Silver Creek, De Witt, Clinton County, Iowa. Schoodic salmon, 1878.
Silver Creek, Iowa. California salmon, 1878.
Silver Creek, Juab County, Utah. California salmon, 1876.
Silver Lake, Dexter, Mich. California salmon, 1878; whitefish, 1876.
Silver Lake, Dutchess County, N. Y. California salmon, 1874.
Silver Lake, Houston County, Minn. California salmon, 1878.
Silver Lake, Kans., Silver Lake. California salmon, 1878, 1879.
Silver Lake, Linden, Mich. Whitefish, 1876.
Silver Lake, Madison, N. H. Schoodic salmon, 1878.

Silver Lake, N. J. California salmon, 1879.
Silver Lake, Portage, Wis. California salmon, 1878.
Silver Lake, Sibley County, Minn. California salmon, 1877.
Silver Lake, Silver Lake, Kans. California salmon, 1878, 1879.
Silver Lake, Stearns County, Minn. California salmon, 1877.
Silver Lake, Washington County, Minn. California salmon, 1877, 1879.
Silver Lake, Wis. Schoodic salmon, 1879.
Silver Lake, Woodstock, Mich. California salmon, 1878.
Sinking Creek, Lewisburgh, Greenbrier County, W. Va. California salmon, 1878.
Sinnemahoning, Potter County, Pa. California salmon, 1879.
Sioux City, Iowa, Floyd River. California salmon, 1875.
Sioux River, Iowa. California salmon, 1879.
Sioux River. (See tributary: Spirit Lake.)
Sir John's Run, W. Va., Potomac River. California salmon, 1875, 1877, 1878.
Sister Lakes, Van Buren County, Mich. California salmon, 1878.
Six Runs, Duplin County, N. C. Shad, 1879.
Six Runs, Sampson County, N. C. Shad, 1878.
Six Runs, Warsaw, N. C. Shad, 1879, 1879.
Sixteen Lake, Allegan County, Mich, California salmon, 1879.
Skaneateles, N. Y., Oswego River. California salmon, 1874, 1875.
Skeelman's Pond, Wabasha County, Minn. Schoodic salmon, 1879.
Skillmans Pond, Red Wing, Minn. California salmon, 1877; Schoodic salmon, 1877.
Skunk River, Iowa. California salmon, 1878, 1879.
Slabtown, Frederick County, Md., Owens Creek. California salmon, 1874, 1876, 1876, 1876.
Slatersville Branch, R. I. Penobscot salmon, 1874, 1875, 1875, 1876.
Slatersville River, R. I. California salmon, 1875.
Sleepy Eye Lake, Brown County, Minn. California salmon, 1878.
Smith Fork of Platte River, Clinton County, Mo. California salmon, 1880.
Smith Pond, Norfolk, Conn. Schoodic salmon, 1876.
Smith's Ferry, Mass., Connecticut River. Shad, 1874, 1875, 1877.
Smith's Grove, Ky., pond. Schoodic salmon, 1878.
Smith's Pond, Wolfeborough, N. C. California salmon, 1879.
Smoky Hill River, Ellis, Kans. California salmon, 1880.
Smoky Hill River, Ellsworth County, Kans. Schoodic salmon, 1879.
Smoky Hill River, Ellsworth, Kans. California salmon, 1877, 1878, 1879, 1880; shad, 1879.
Smoky Hill River, Hayes City, Kans. California salmon, 1880.
Smoky Hill River, Fort Harker, Kans. California salmon, 1880.
Smoky Hill River. (See tributaries: Saline River, Spring Creek, Big Creek, Chapman's Creek, Solomon and Salina Rivers.)
Smyth County, Va., Holston River. Schoodic salmon, 1877.

Smyth County, Va. (See Atkin's Tank, Va.)
Snipsic Lake, Rockville, Conn. Schoodic salmon, 1876, 1877, 1878, 1879.
Snow Hill, Md., Pocomoke River. California salmon, 1878.
Snow Hill, Md., Pocomoke River. Shad, 1878.
Snow's Pond, North Rochester, Mass. Schoodic salmon, 1878.
Snyder County, Pa., Penn's Creek. California salmon, 1877.
Soft Water Lake, Kent County Mich. California salmon, 1876.
Soldier River, Topeka, Kans. California salmon, 1878, 1879.
Solomon City, Kans., Solomon River. California salmon, 1878, 1879, 1880.
Solomon River, Beloit, Kans. California salmon, 1878, 1879.
Solomon River, Saline, Kans. Shad, 1879.
Solomon River, Solomon City, Kans. California salmon, 1878, 1879, 1880.
Somerset County, Md. (See Crisfield, Md.; Eden, Md.; Princess Anne, Md.; Newtown, Md.)
Somerset County, N. J., North Branch Raritan River. California salmon, 1879.
Somerset County, N. J., Rockaway River. California salmon, 1879.
Somerset County, N. J. (See Raritan, N. J.; South Branch, N. J.)
Somerset County, Pa. Schoodic salmon, 1878.
Somerset, Ky., Cumberland River. Shad, 1878.
Somerset, Ky., Pitman Creek. Schoodic salmon, 1878.
Somerset, Mich., Rasin River. California salmon, 1875.
Sonoma County, Cal., Mark West Creek. Whitefish, 1879.
South Abington, Mass. Schoodic salmon, 1876.
South Anne River. (See tributary: Little River.)
Southard's Lake, Raisin Centre, Mich. California salmon, 1878.
South Branch, N. J., South Branch of Raritan River. Penobscot salmon, 1875.
South Carver, Mass. Schoodic salmon, 1876.
South Chicago, Ill., Calumet River. Shad, 1873.
South Coventry, Conn., Wangambourg Pond. Schoodic salmon, 1877.
South Coventry, Conn., Waramaug Pond. Schoodic salmon, 1878, 1879.
South Coventry, Conn., Waugaboniz Lake. Schoodic salmon, 1879.
South Elkhorn, Woodford County, Ky. California salmon, 1877.
South Fork River, Morganton, N. C. California salmon, 1879.
South Hadley Falls, Mass., Connecticut River. Shad, 1875, 1876, 1877, 1877.
Southampton County, Va. (See Franklin, Va.)
South Kent, Conn., Spectacle Pond. Schoodic salmon, 1876.
South Lawn, Ill., Calumet River. Penobscot salmon, 1874.
South Platte. (See tributaries: Green Lake and Clear Lake.)
Southport, Conn., Mill River. Penobscot salmon, 1875, 1877.
Southport, Conn., Perry's Pond. Schoodic salmon, 1880.

Southport, Conn., Southport Pond. Schoodic salmon, 1879.
Southport Pond, Southport, Conn. Schoodic salmon, 1879.
Southport River. (See tributary : Main River.)
South River, Greenville, Va. California salmon, 1878.
South River, Lexington, Va. California salmon, 1878, 1880; Schoodic salmon, 1879.
South River, Waynesborough, Va. Shad, 1878.
South Toledo, Ohio, Maumee River. California salmon, 1877.
South Vernon, Windham County, Vt., Connecticut River. Shad, 1875, 1875.
South Weymouth, Mass., Weymouth Great Pond. Schoodic salmon, 1876, 1877, 1878.
South Windham, Conn., Balahack Brook. Schoodic salmon, 1877.
Spartanburgh County, S. C. (See Gaffney City, S. C.; Spartanburgh, Court-House, S. C.
Spartanburgh Court-House, S. C., Broad River. Shad, 1876.
Spartanburgh Court-House, S. C., Packlette River. California salmon, 1879.
Sparta, Wis., La Crosse River. California salmon, 1879.
Spectacle Pond, Sandwich, Mass. Schoodic salmon, 1876, 1877, 1880.
Spectacle Pond, South Kent, Conn. Schoodic salmon, 1876.
Spectacle Ponds, Kent, Conn. Schoodic salmon, 1877, 1878.
Spencer County, Ky. (See Taylorsville, Ky.)
Spencer Creek, Montgomery County, Ky. California salmon, 1877.
Spencerville, Md., Patuxent River. California salmon, 1878.
Spencerville, Md., tributary of Patuxent River. Schoodic salmon, 1878.
Spesutie Narrows, Havre de Grace, Md. Shad, 1877 (12 deposits), 1878 (10 deposits), 1879 (15 deposits), 1880 (10 deposits).
Spirit Lake, Iowa. Penobscot salmon, 1876.
Spirit Lake, Sauk County, Wis. California salmon, 1877.
Spofford Lake, Chesterfield, N. H. Schoodic salmon, 1880.
Spot Pond, Stoneham, Mass. Schoodic salmon, 1878.
Sprague's Pond, Charlotte, Me. Schoodic salmon, 1878.
Spring Branch, Iowa. California salmon, 1879.
Spring Brook Creek, Kalamazoo, Mich. California salmon, 1874.
Spring Brook, Cayuga County, N. Y. California salmon, 1879.
Spring Brook, Ontario County, N. Y. California salmon, 1879.
Spring Brook, Toledo, Ohio. California salmon, 1880.
Spring Brook, Wheatland, N. Y. California salmon, 1878.
Spring Creek, Bellefonte, Pa. California salmon, 1874.
Spring Creek, Brookville, Kans. California salmon, 1878, 1879.
Spring Creek, Caledonia, Livingston County, N. Y. Schoodic salmon, 1878.
Spring Creek, Delaware, Iowa. California salmon, 1875.
Spring Creek, Fillmore County, Minn. California salmon, 1878.
Spring Creek, Fort Harker, Kans. Schoodic salmon, 1880.

Spring Creek, Livingston County, N. Y. California salmon, 1879, 1879.
Spring Creek, Lodi, Wis. California salmon, 1878.
Spring Creek, Monroe County, N. Y. California salmon, 1878, 1878.
Spring Creek, Newville, Pa. California salmon, 1877.
Spring Creek, Oneida County, N. Y. California salmon, 1878.
Spring Creek, Rice County, Minn. California salmon, 1878.
Spring Creek, Trivoli, Kans. Schoodic salmon, 1880.
Spring Creek, Tompkins County, N. Y. California salmon, 1878.
Spring Creek, Wetmore, Kans. California salmon, 1878, 1879.
Springfield, Mo., James River. Shad, 1877.
Springfield, N. H., Star Pond. Schoodic salmon, 1879.
Spring Lake, Dakota County, Minn. Schoodic salmon, 1879.
Spring Lake, Scott County, Minn. California salmon, 1878.
Spring Pond, Lynn, Mass. Schoodic salmon, 1878.
Spring River, Carthage, Mo. California salmon, 1878, 1879.
Spring Valley, Minn., tributary of Root River. California salmon, 1878.
Springville, Iowa, Cedar River. California salmon, 1875.
Spruce Creek, Herkimer County, N. Y. California salmon, 1874.
Spunk Creek, Avon, Minn. California salmon, 1877.
Squam Lake, Holderness, N. H. Schoodic salmon, 1879.
Square Lake, Washington County, Minn. California salmon, 1876.
Square Pond, Sherman, Conn. Schoodic salmon, 1878.
Stacy, Minn., Goose Creek. California salmon, 1879.
Stafford Springs, Conn., Stafford Springs Reservoir. Schoodic salmon, 1878, 1879.
Stafford Springs Reservoir, Stafford Springs, Conn. Schoodic salmon, 1878, 1879.
Stark, N. H., North Pond. Schoodic salmon, 1880.
Star Pond, Springfield, N. H. Schoodic salmon, 1879.
Staunton River, Big Spring Depot, Va. California salmon, 1876.
Staunton River, Staunton Station, Va. Shad, 1875.
Staunton River, Va. California salmon, 187–.
Staunton Station, Montgomery County, Va., Staunton River. Shad, 1875.
Staunton, Va., Middle River. Schoodic salmon, 1879.
Stearns County, Minn., Cornelian Lake. California salmon, 1877, 1878.
Stearns County, Minn., Grand Lake. California salmon, 1876, 1878.
Stearns County, Minn., Kimball Lake. California salmon, 1877, 1878.
Stearns County, Minn., Pearl Lake. California salmon, 1876, 1878.
Stearns County, Minn., Pleasant Lake. California salmon, 1876, 1877, 1878.
Stearns County, Minn., Saint John's Lake. California salmon, 1878.
Stearns County, Minn., Sauk River. California salmon, 1877.
Stearns County, Minn., Silver Lake. California salmon, 1877.
Stearns County, Minn. (See Avon, Minn.)
Steele County, Minn., Owatonna River. California salmon, 1875; Penobscot salmon, 1875; Schoodic salmon, 1875.

Steele County, Minn. (See Owatonna, Minn.)
Steers' Pond, North Scituate, R. I. Schoodic salmon, 1876, 1878.
Stevens County, Minn. California salmon, 1876.
Stevens County, Minn., Donnelly Lake. California salmon, 1878.
Stevens County, Minn., Engle Lake. California salmon, 1878.
Stevens County, Minn., forks of Otter Tail and Bois des Sioux Rivers. California salmon, 1877.
Stevens County, Minn., Frog Lake. California salmon, 1878.
Stevens County, Minn., Gavin's Lake. California salmon, 1878.
Stevens County, Minn., Lake Foss. California salmon, 1879.
Stevens County, Minn., McCarthy's Lake. California salmon, 1877.
Stevens County, Minn., Pomme de Terre River. California salmon, 1877, 1877, 1877.
Stewartstown, N. H., Diamond Pond. Schoodic salmon, 1880.
Still River, Brookfield, Conn. Schoodic salmon, 1880.
Stillwater, Minn., Saint Croix River. California salmon, 1876.
Stockbridge, Mass., Lake Mahkeenac. Schoodic salmon, 1878, 1879, 1880.
Stocker's Pond, Grantham, N. H. Schoodic salmon, 1879.
Stockton, Ga., Allapahaw River. Shad, 1879.
Stokes County, N. C. (See Germanton, N. C.)
Stoneham, Mass., Spot Pond. Schoodic salmon, 1878.
Stoner Creek, Clark County, Ky. California salmon, 1876.
Stoney Branch, Bel Air, Md. California trout, 1880.
Stoney Run, Baltimore, Md. California trout, 1880; Schoodic salmon, 1879.
Stoney Run, Waverly, Md. California trout, 1880.
Stony Creek, Pa. California salmon, 1876.
Stony Lake, La Porte, Ind. Schoodic salmon, 1880.
Storm Lake, Iowa. Penobscot salmon, 1876.
Storm Lake, Iowa, Des Moines River. California salmon, 1875.
Storm Lake, Iowa, Storm Lake. California salmon, 1875.
Storm Lake, Storm Lake, Iowa. California salmon, 1875.
Storm Spring, Iowa., tributary of Mississippi River. California salmon, 1875.
Strafford County, N. H. (See Milton, N. H.; New Durham, N. H.)
Straits Lake, Oak County, Mich. Whitefish, 1876.
Stranger, Kans., Stranger River. California salmon, 1878, 1879.
Stranger River, Stranger, Kans. California salmon, 1878, 1879.
Strasburgh, Va., Cedar Creek. California salmon, 1876.
Strasburgh, Va., North Fork, Shenandoah River. California salmon, 1876.
String Lake, Cottonwood County, Minn. California salmon, 1876.
Strode's Creek, Clark County, Ky. California salmon, 1876.
Strouble's Creek, Va. Schoodic salmon, 1878.

Strubel's Lake, Andover, Sussex County, N. J. Schoodic salmon, 1878.
Sturgeon Lake, Colton, Mich. California salmon, 1876.
Style's Pond, Waterford, Vt. Schoodic salmon, 1878.
Sucker Brook, Fall River, Mass. Schoodic salmon, 1878.
Sudbury River, Framingham, Mass. Schoodic salmon, 1876, 1877.
Suffolk County, N. Y. (See Sayville, N. Y.)
Suffolk, Va., south branch of Nansemond River. Shad, 1878.
Sugar Lake, Platte County, Mo. California salmon, 1880.
Sugar Lake, Wright County, Minn. California salmon, 1877.
Sugar River, Brodhead, Wis. California salmon, 1879.
Sullivan County, N. H. (See Acworth, N. H.; Charlestown, N. H.; Grantham, N. H.; Springfield, N. H.)
Sullivan County, N. Y. (See Liberty, N. Y.)
Sulphur Spring, Md., pond, tributary of Patapsco River. California trout, 1880; Schoodic salmon, 1880.
Summer Hill Lake. (See tributary: Spring Brooks.)
Summers County, W. Va. (See Hinton, W. Va.)
Summit of Sierra, Tahoe, and Donner Lakes. Whitefish, 1879.
Summit, Placer County, California, Sereno Lake. Whitefish, 1877.
Sumter County, &c., Lynch's Creek. Shad, 1880.
Sunapee Lake, Newbury, N. H. Schoodic salmon, 1878, 1879.
Sunapee Lake, N. H. Schoodic salmon, 1880.
Sunfish Lake, Dakota County, Minn. California salmon, 1876.
Sunflower River, Friar's Point, Miss. Shad, 1878.
Suntaug Lake, Salem, Mass. Schoodic salmon, 1878.
Superior Lake. (See tributaries: Saint Louis River, Twin Lakes, and Big Lake.)
Surrey, Clare County, Mich., Crooked Lake. California salmon, 1878; Schoodic salmon, 1878.
Surry, Me., Patten's Brook. Penobscot salmon, 1876.
Susquehanna County, Pa., Heart Lake. Schoodic salmon, 1880.
Susquehanna County, Pa., Tigley Lake. Schoodic salmon, 1880.
Susquehanna River, Branch of, Swatara, Pa. California salmon, 1875.
Susquehanna River, Battery Light, Md. Shad, 1879, 1879, 1879, 1879.
Susquehanna River, Chicquesalungo, Pa. California salmon, 1875, 1877, 1877.
Susquehanna River, Donegal, Pa. California salmon, 1875.
Susquehanna River, Georgetown, Pa. Shad, 1880.
Susquehanna River, Harrisburgh, Pa. Shad, 1879, 1880.
Susquehanna River, Havre de Grace, Md. Shad, 1876, 1877 (7 deposits), 1878 (2 deposits), 1879 (3 deposits), 1880 (11 deposits.)
Susquehanna River, Marietta, Pa. California salmon, 1875, 1877, 1877, 1877, 1880.
Susquehanna River, Md. Schoodic salmon, 1879.
Susquehanna River, North Branch, Chillisquaque, Pa. California salmon, 1877.

Susquehanna River, Old Bay Fishery, Md. Shad, 1879, 1879, 1879.
Susquehanna River, Port Deposit, Md. Shad, 1879, 1879.
Susquehanna River, Swan Creek, Md. Shad, 1876, 1880.
Susquehanna River, tributary of, Coneloquinet, Pa. California salmon, 1876.
Susquehanna River, tributary of, Chiques, Pa. California salmon, 1876.
Susquehanna River, tributary of, Columbia, Pa. California salmon, 1876.
Susquehanna River, tributary of, Harrisburg, Pa. California salmon, 1872, 1873, 1876.
Susquehanna River, tributary of, Marietta, Pa. California salmon, 1876.
Susquehanna River, tributary of, Swatara, Pa. California salmon, 1876.
Susquehanna River, upper waters of, Pa. Penobscot salmon, 1880.
Susquehanna River, Watson's Island, Md. Shad, 1880 (8 items).
Susquehanna River. (See tributaries: Blackston, Pawcatuck and Patuxent Rivers, Deer Creek, Octorora Creek, Spesutie Narrows, North East, Cohocton River, Swatara Creek, Chiquesalunga Creek, Donegal Creek, Codorus Creek, Yellow Breeches Creek, Donegal Springs, Pine Creek, Coneloquinet Creek, Mahantonga River, Bald Eagle River, Buffalo Creek, Stony Creek, Maiden Run, Bowman's Creek, Maiden Creek, Spring Creek, Penn's Creek, Kettle Creek, Trout Run, Juniata River, Harvey's Lake.)
Sussex County, Del. (See Seaford, Del.)
Sussex County, N. J., Drake's Pond. Schoodic salmon, 1879.
Sussex County, N. J., Swartswood Lake. California salmon, 1879.
Sussex County, N. J. (See Andover, N. J.)
Suwanee River. (See tributaries: Allapahaw River and Little River.)
Swan Creek, Harford County, Md., Susquehanna River. Shad, 1876, 1880.
Swannanoa River, Buncombe County, N. C. California salmon, 1877; California trout, 1880.
Swanton, Md., North Branch of Potomac River. California salmon, 1878.
Swanton, Md., Savage River. California salmon, 1877.
Swanton, Vt., Missisquoi River. California salmon, 1873; shad, 1874.
Swartswood Lake, Sussex County, N. J. California salmon, 1879.
Swatara Creek, Dauphin County, Pa. Penobscot salmon, 1874.
Swatara Creek, Pa. California salmon, 1874.
Swatara, Pa., Swatara River. California salmon, 1875, 1876, 1877.
Swatara River, Swatara, Pa. California salmon, 1875, 1876, 1877.
Swedesborough, N. J., Oldman's Creek. California salmon, 1876.
Swift County, Minn., Hassel Lake. California salmon, 1878.
Swift County, Minn., Saint Malachy's Lake. California salmon, 1877.
Swift County, Minn., Saint Mary's Lake. California salmon, 1877.
Swift County, Minn. (See Benson, Minn.)
Syke's Pond, Wis. California salmon, 1879.
Sykesville, Md., Patapsco River. California salmon, 1876, 1878.

Sykesville, Md., stream. California trout, 1880.
Sylvan Lake, Dutchess County, N. Y. Schoodic salmon, 1879.
Tahoe Lake, Placer County, Cal. Whitefish, 1877, 1879.
Tahoe Lake, Nevada County, Cal. Whitefish, 1879.
Takota Lake, Le Sueur County, Minn. California salmon, 1879.
Talbot County, Md. (See Easton, Md.; Sherwood Mills, Md.; Trappe, Md.; Wye Mills, Md.; Cordova Station, Md.)
Tallahatchie River, La Fayette County, Miss. Shad, 1878, 1879.
Tallahatchie River. (See tributary: Tippa River.)
Tallapoosa County, Ala. (See Salisbury, Ala.)
Tallapoosa River, Montgomery, Ala. Shad, 1877.
Tallapoosa River, Salisbury, Ala. Shad, 1878.
Tama City, Tama County, Iowa, Iowa River. Schoodic salmon, 1878.
Tama County, Iowa. (See Tama City, Iowa.)
Tangipahoa County, La. (See Amite City, La.; Tickfaw, La.)
Tangipahoa, Miss., Tangipahoa River. California salmon, 1876.
Tangipahoa River, Amite City, La. California salmon, 1876.
Tangipahoa River, La. California salmon, 1875.
Tangipahoa River, Tangipahoa, Miss. California salmon, 1876.
Tank Station, Md., North Patapsco River. California salmon, 1874, 1876, 1876, 1876, 1878, 1878, 1879.
Tank Station, Carroll County, Md., Patuxent River. California salmon, 1877.
Tanner's Creek, Guilford, Ind. California salmon, 1874, 1876.
Tanner's Lake, Washington County, Minn. California salmon, 1878.
Tannery, Md., Evitt's Creek. California salmon, 1874.
Tarlton Pond, Piermont, N. H. Schoodic salmon, 1879.
Tar River, Granville County, N. C. Shad, 1877, 1878, 1878.
Tar River, Rocky Mount, N. C. Shad, 1879, 1879.
Taunton River, Bridgewater, Mass. Shad, 1876, 1877.
Taunton River, Middleborough, Mass. Shad, 1876, 1877.
Taylor County, Ky., Pittman Creek. California salmon, 1877.
Taylor County, W. Va. (See Grafton, W. Va.)
Taylor's Falls, Chisago County, Minn. California salmon, 1875.
Taylorsville, Spencer County, Ky., Asher's Creek. Schoodic salmon, 1878.
Taylorsville, Va., Little River. Shad, 1878.
Tehama, Cal., Sacramento River. Shad, 1873, 1876, 1877, 1878, 1880.
Tehama County, Cal. (See Tehama, Cal.)
Tenburg Brook, Fillmore County, Minn. California salmon, 1878.
Ten Mile Creek, Boyd's, Md. California salmon, 1878.
Tennessee River, Chattanooga, Tenn. Shad, 1876, 1879.
Tennessee River, Johnsonville, Tenn. Shad, 1879.
Tennessee River. (See tributaries: Pigeon River, French Broad River, Eastannallee River, Holston River, North Fork of Holston River and South Fork Holston River.)

Tensas River, R. R. crossing, Madison County, La. Shad, 1879.
Tensas River, (See tributary: Bayou Macon.)
Terre Haute, Ind., Wabash River. Shad, 1878, 1879.
Terry Lake, Washington County, Minn. California salmon, 1876.
Thames River, brooks tributary to, Willimantic, Conn. Schoodic salmon, 1878, 1879.
Thames River, tributary of, Conn. Penobscot salmon, 1873.
Thames River, Putnam, Conn. Shad, 1874.
Thames River. (See tributaries: Quinnebaug River, Shetucket River, Natchaug Branch, Natchaug River.)
The Mill, Bertie County, N. C., Salmon Creek. Shad, 1878.
Thomas' Spring Branch, Scott County, Ky. California salmon, 1876.
Thompsonville, Conn., tributaries of the Connecticut River. Schoodic salmon, 1878.
Thorn Apple Lake, Barry County, Mich. California salmon, 1875.
Thorn Apple Lake, Eaton County, Mich. California salmon, 1875.
Thornton, N. H., tributary of Merrimack River. Penobscot salmon, 1873.
Three Lakes, Marquette County, Mich. California salmon, 1876.
Three Mile Lake, Chippewa County, Wis. California salmon, 1877.
Three Rivers, Mich., Portage River. California salmon, 1876.
Three Rivers, Mich., Saint Joseph River. California salmon, 1876.
Three Runs, S. C. California salmon, 1880.
Tickfaw, La., Amite River. Shad, 1878.
Tickfaw, La., Notalbany River. California salmon, 1876; shad, 1875.
Tiffin River, Woodstock, Mich. California salmon, 1878.
Tigley Lake, Susquehanna County, Pa. Schoodic salmon, 1880.
Tilton, N. H., Winnipesaukee River. Shad, 1877.
Timber Creek, Woodbury, N. J. California salmon, 1877.
Timber Creek, N. J. California salmon, 1877.
Tinkham Lake, Miles, Berrien County, Mich. Schoodic salmon, 1878.
Tippah County, Miss. (See Ripley, Miss.)
Tippah River, Ripley, Miss. Shad, 1879.
Tippecanoe County, Ind. See La Fayette, Ind.
Tipton, Iowa, Cedar River. California salmon, 1874, 1875.
Tittabawassee River, Midland Mich. California salmon, 1875.
Tobacco Run, Aberdeen, Md. California salmon, 1876.
Tobyhanna Lake, Scranton Pa. Schoodic salmon, 1879.
Toccoa, Ga., tributary of Savannah River. California salmon, 1877.
Todd County, Minn., Osakin Lake. California salmon, 1877.
Todd County, Minn., Sauk Lake. California salmon, 1877.
Toledo, Ohio, Lake Erie. Whitefish, 1876, 1876.
Toledo, Ohio, Maumee Rapids. California salmon, 1878.
Toledo, Ohio, Maumee River. Penobscot salmon, 1875; Schoodic salmon, 1878, 1879.
Toledo, Ohio, Spring Brook. California salmon, 1880.

Tolland County, Conn. (See Bolton, Conn.; Rockville, Conn.; South Coventry, Conn.; Stafford Springs, Conn.)
Tolman Pond, Nelson, N. H. Schoodic salmon, 1880.
Tomah, Wis., Lemonweir River. California salmon, 1879.
Tombigbee River, Aberdeen, Miss. Shad, 1878.
Tombigbee River, Columbia, Ala. Shad, 1879.
Tombigbee River, Demopolis, Ala. Shad, 1878.
Tombigbee River, Fulton, Miss. Shad, 1878.
Tompkins County, N. Y., Spring Creeks. California salmon, 1878.
Tom's River, Va. Schoodic salmon, 1878.
Tooele County, Utah, Twin Spring Creek. California salmon, 1876.
Topeka, Kans., Big Blue River. Shad, 1877.
Topeka, Kans., Soldier River. California salmon, 1878, 1879.
Topeka, Kans., Wakarusa River. California salmon, 1880.
Torch Lake, Kalkaska County, Mich. California salmon, 1876.
Totes Run, Wythe County, Va. California salmon, 1879.
Totes Run, Wytheville, Va. California salmon, 1880.
Town Creek, Germanton, N. C. California salmon, 1879.
Towner's Lake, Iowa California salmon, 1879.
Town Line, Calhoun County, Mich. California salmon, 1878.
Towsontown, Baltimore County, Md., Gunpowder River. California salmon, 1878, 1879.
Transquaking River, Airey's Station, Md. California salmon, 1879; shad, 1879.
Transquaking River, Linkwood, Md. California salmon, 1879.
Transquaking River. (See tributary: Chickacomico River.)
Trappe River, Berlin, Md. California salmon, 1879, 1880.
Travis County, Tex. (See Austin, Tex.)
Tread Haven, Easton, Md. Shad, 1878.
Trenton, Ill., pond. Schoodic salmon, 1878.
Trent River, Pollocksville, N. C. Shad, 1879.
Tri-Echo Lake, Milton, N. H. California salmon, 1879.
Trigg County, Ky., Little River. California salmon, 1877.
Trinity River, Dallas, Tex. Shad, 1879.
Trivoli, Kans., Bradley Spring. Schoodic salmon, 1880.
Trivoli, Kans., Spring Creek. Schoodic salmon, 1880.
Troup County, Ga. (See West Point, Ga.)
Trout Branch, Baltimore, Md. Schoodic salmon, 1880.
Trout Branch, Md. California trout, 1880.
Trout Run, Hardy County, W. Va. Schoodic salmon, 1878.
Trout Run, Perry County, Pa. California salmon, 1877.
Trout Run, Ralston, Pa. Penobscot salmon, 1880.
Trout Run, Williamsport, Pa. California salmon, 1879.
Truckee River, Reno, Nev. California salmon, 1879.
Tuckahoe Creek, Hillsborough, Md. California salmon, 1876, 1878.
Tuckahoe, N. J., Tuckahoe River. California salmon, 1876.

Tuckahoe River, Hillsborough, Md. Shad, 1878, 1879.
Tuckahoe River, N. J. California salmon, 1878.
Tuckahoe River, Tuckahoe, N. J. California salmon, 1876.
Tugaloo River, R. R. Crossing, Habersham County, Ga. Shad, 1879.
Tugaloo River, S. C. California salmon, 1880.
Tugaloo River. (See tributaries: Seneca River and Martin's Creek.)
Tulare County, Cal., Tulare Lake. Schoodic salmon, 1878; whitefish, 1875, 1879.
Tulare Lake, Cal. Whitefish, 1875, 1879.
Tulare Lake, Tulare County, Cal. Schoodic salmon, 1878.
Tunnel City, Wis., Lemonweir River. California salmon, 1879, 1879.
Turkey River, Clermont, Iowa. California salmon, 1875.
Turkey River, Fayette, Iowa. California salmon, 1875.
Turkey River, Greeley, Iowa. California salmon, 1875.
Turkey River, Iowa. California salmon, 1879, 1879.
Turkey River, Maynard, Iowa. California salmon, 1875.
Turkey River, West Union, Iowa. Penobscot salmon, 1875.
Turtle Lake, Ramsey County, Minn. California salmon, 1876.
Tuscaloosa, Ala., Black Warrior River. Shad, 1879.
Tuscaloosa County, Ala. (See Tuscaloosa, Ala.)
Tuscarawas County, Ohio. (See New Comerstown, Ohio.)
Tuscarawas River, New Comerstown, Ohio. California salmon, 1878.
Twin Lake, Elgin, Ill. California salmon, 1875.
Twin Lake, Grant County, Minn. California salmon, 1878.
Twin Lake, Iowa. Penobscot salmon, 1876.
Twin Lake, Petosky, Mich. Whitefish, 1876.
Twin Lakes, Chapinsville, Conn. Schoodic salmon, 1876, 1879.
Twin Lakes, Dakota County, Minn. California salmon, 1878, 1880.
Twin Lakes, Kalamazoo County, Mich. California salmon, 1875.
Twin Lakes, Pine County, Minn. California salmon, 1875.
Twin Lakes, Pomeroy, Iowa. California salmon, 1875.
Twin Lakes, Richmond, McHenry County, Ill. Schoodic salmon, 1878.
Twin Lakes, Salisbury, Conn. Schoodic salmon, 1877, 1878.
Twin Lakes, Washington County, Minn. California salmon, 1877.
Twin Spring Creek, Tooele County, Utah. California salmon, 1876.
Tye River, Nelson County, Va. California salmon, 1876; Schoodic salmon, 1877.
Tygart's Valley River, Barbour County, W. Va. California salmon, 1879, 1880.
Tygart's Valley River, Randolph County, W. Va. California salmon, 1879, 1880.
Tygart's Valley River, Grafton, W. Va. Shad, 1879.
Tygart's Valley River, tributary of, Randolph County, W. Va. Schoodic salmon, 1878.
Tygert River, Carter County, Ky. California salmon, 1878.
Tyrone, Pa., Juniata River. California salmon, 1879.

Ulcofauhanchee River, Covington, Ga. Shad, 1879.
Union Bridge, Md., Pipe Creek. California salmon, 1874.
Union Bridge, Md., pond tributary to Big Pipe Creek. Schoodic salmon, 1879.
Union County, Pa. (See Lewisburgh, Pa.; Mifflinburgh, Pa.)
Union Lake, Rice County, Minn. California salmon, 1878.
Union Springs, Ala., Conecuh River. Shad, 1879.
Union Springs, Ala., Pea River. Shad, 1879.
Uniontown, D. C., pond. California trout, 1880.
Unionville, Md., pond. California trout, 1880; Schoodic salmon, 1880.
Unity, Me., pond. Schoodic salmon, 1879.
Unkechewalom Pond, Lunenburgh, Mass. Schoodic salmon, 1876, 1877.
Upper Bear River, Rich County, Utah Territory California salmon, 1876, 1876.
Upper Creek, Burke County, N. C. California trout, 1880.
Upper Creek, Morgantown, N. C. California salmon, 1879.
Upper Paxton, Dauphin County, Pa., Mahantonga River. California salmon, 1873.
Upton's Pond, Dutchess County, N. Y. Schoodic salmon, 1879.
Utah County, Utah, Mill Creek. California salmon, 1876.
Utica, Mich., Clinton River. California salmon, 1875.
Vadnais Lake, Ramsey County, Minn. California salmon, 1876.
Valley Falls, Kans., Delevan River. California salmon, 1880.
Valley Pond, Woodbridge, Conn. Schoodic salmon, 1877, 1878.
Van Buren County, Buck's Creek. California salmon, 1879.
Van Buren County, Mich., Dowagiac River. California salmon, 1879.
Van Buren County, Mich., Mill Stream. California salmon, 1879.
Van Buren County, Mich., Sister Lakes. California salmon, 1878.
Van Buren County, Mich., Almena, Mich., Paw-Paw, Mich.
Vanceburgh, Ky., Kinniconick Creek. Schoodic salmon, 1878.
Vaughan, Miss., Big Black River. Shad, 1878.
Venango, Kans., pond. Schoodic salmon, 1880.
Verdigris River, Independence, Kans. California salmon, 1878, 1879.
Vergennes, Vt., Otter Creek. Shad, 1873, 1874.
Vermillion River, south branch of, Dakota County, Minn. California salmon, 1878.
Vermillion River, Wamego, Kans. California salmon, 1878, 1879, 1880.
Vernon County, Mo. (See Schell City, Mo.)
Vernon River, Mount Vernon, Ohio. California salmon, 1879.
Verona Lake, N. J. California salmon, 1879.
Versailles, Ky., pond. Schoodic salmon, 1878.
Vigo County, Ind. (See Terre Haute, Ind.)
Vineland, N. J., Maurice River. California salmon, 1876.
Volga River, Fayette, Iowa. California salmon, 1875.
Volga River, Greeley, Iowa. California salmon, 1875.
Volga River, Iowa. California salmon, 1879.
Voluntown, Conn., Beach Pond. Schoodic salmon, 1876

Wabash County, Ind. (See Wabash, Ind.)
Wabash, Ind., Wabash River. California salmon, 1876, 1876.
Wabash River, La Fayette, Ind. Shad, 1880.
Wabash River, Logansport, Ind. Shad, 1873, 1874.
Wabash River, Terre Haute, Ind. Shad, 1878, 1879.
Wabash River, Wabash, Ind. California salmon, 1876, 1876.
Wabash River. (See tributaries: Embarrass River, Mississinewa River, White River.)
Wabasha County, Minn., Mazeppa. California salmon, 1876, 1878.
Wabasha County, Minn., North Branch Zumbro. California salmon, 1878.
Wabasha County, Minn., Skellman's Pond. Schoodic salmon, 1879.
Wabasha County, Minn. (See Lake City, Minn.; Mazeppa, Minn.)
Waconica Lake, Carver County, Minn. California salmon, 1878.
Wakarusa River, Topeka, Kans. California salmon, 1880.
Wakasa River, Ottawa, Kans. California salmon, 1878, 1879.
Wake County, N. C., Neuse River. Shad, 1877.
Wake County, N. C. (See Neuse, N. C.; Raleigh, N. C.)
Wakefield, Md., Pipe Creek. California salmon, 1874, 1876.
Wakefield, Mass., Lake Quannapowitt. Schoodic salmon, 1877, 1878, 1879.
Wakefield, N. H., East Pond. Schoodic salmon, 1879.
Wakefield, N. H., Lorewell's Pond. California salmon, 1879.
Wakefield, N. H., Newechewaunock Lake. California salmon, 1879.
Waldo County, Me. (See Unity, Me.)
Walhonding River, Coshocton, Ohio. California salmon, 1877.
Walker Creek, Fillmore County, Minn. California salmon, 1878.
Walker, Iowa, Big Rock Creek. California salmon, 1875.
Walker's Pond, Boscawen, N. H. Schoodic salmon, 1880.
Walker's Pond, Conway, N. H. Schoodic salmon, 1880.
Walkersville, W. Va., West Fork of Monongahela. California salmon, 1878.
Walkill River. (See tributary: Greenwood Lake.)
Walled Lake, Oak County, Mich. Whitefish, 1876.
Waller County, Tex. (See Hempstead, Tex.)
Wall Lake, Iowa. California salmon, 1879, 1879.
Walloon Lake. (See tributary: Bear Creek.)
Wallow Lake, Charlevoix County, Mich. California salmon, 1878.
Wall's Lake, Oakland County, Mich. Penobscot salmon, 1873.
Wallum Pond, Burrillville, R. I. Schoodic salmon, 1876, 1878.
Walnut River, El Dorado, Kans. California salmon, 1878, 1879; Shad, 1879.
Walnut River, Great Bend, Kans. California salmon, 1878, 1879; Shad, 1879.
Walter Creek, Monroe County, N. Y. California salmon, 1878.

Waltham, Mass., Hardy's Pond. Schoodic salmon, 1877, 1878, 1879, 1880.
Walworth County, Wis., Boothe's Creek. California salmon, 1878.
Walworth County, Wis., Geneva Lake. California salmon, 1875, 1876, 1877, 1878, 1879; Schoodic salmon, 1876, 1878, 1879.
Walworth County, Wis., Perch Lake. California salmon, 1878.
Walworth County, Wis. (See Geneva, Wis.)
Wamego, Kans., Vermillion River. California salmon, 1878, 1879, 1880.
Wangambourg Pond, South Coventry, Conn. Schoodic salmon, 1877.
Wanouscoponus Lake, Lakeville, Conn. Schoodic salmon, 1876, 1877, 1879.
Wantonwan County, Minn., Cedar Lake. California salmon, 1879.
Wapakoneta, Ohio, Auglaize River. California salmon, 1875.
Wapello County, Iowa. (See Ottumwa, Iowa.)
Wapsie River, Iowa. California salmon, 1878, 1879.
Wapsie River. (See Wapsipinecon River.)
Wapsipinecon River, Anamosa, Iowa. California salmon, 1874, 1875.
Wapsipinecon River, Dixon, Iowa. California salmon, 1874.
Wapsipinecon River, Independence, Iowa. California salmon, 1875.
Wapsipinecon River, Oxford, Iowa. California salmon, 1875.
Waramaug Lake, New Preston, Conn. Schoodic salmon, 1877.
Waramaug Pond, South Coventry, Conn. Schoodic salmon, 1878, 1879.
Waramaug Pond, Warren, Conn. Schoodic salmon, 1876.
Warden's Pond, Kingston, R. I. Schoodic salmon, 1878.
Warner, N. H., Bean Pond. Schoodic salmon, 1880.
Warren and Barrington Rivers, R. I. Shad, 1877.
Warren, Conn., Waramaug Pond. Schoodic salmon, 1876.
Warren County, Ky., Barren River. California salmon, 1877, 1878; shad, 1878.
Warren County, Ky., Jasper River. California salmon, 1878.
Warren County, Ky. (See Bowling Green, Ky.; Smith's Grove, Ky.)
Warren County, N. J., Paulinskill Creek. California salmon, 1879.
Warren County, N. J. (See Oxford, N. J.)
Warren County, Pa., pond. Schoodic salmon, 1878.
Warren County, Va. (See Riverton, Va.)
Warren, Ind., Grapevine Creek. California salmon, 1875.
Warren, Md., Gunpowder River. California trout, 1880.
Warren, N. H., Baker's River. California salmon, 1876; Penobscot salmon, 1876.
Warren River, Bristol County, R. I. Shad, 1874, 1875, 1877.
Warsaw, N. C., Six Runs. Shad, 1879, 1879.
Warwick Pond, Warwick, R. I. Schoodic salmon, 1876.
Warwick, Kent County, R. I., Gorton's Pond. Schoodic salmon, 1876.
Warwick, Kent County, R. I., Warwick Pond. Schoodic salmon, 1876.
Waseca County, Minn., Clear Lake. California salmon, 1876.
Waseca County, Minn., Elysian Lake. California salmon, 1875, 1876, 1879, 1880; Schoodic salmon, 1875.

Washington County, D. C. (See Anacostia, D. C.; Georgetown, D. C.; and Washington, D. C.)
Washington County, Kans. (See Clifton, Kans.; and Washington, Kans.)
Washington County, Me., Grand Lake. Schoodic salmon, 1878, 1879.
Washington County, Me. (See Calais, Me.; Charlotte, Me.; Cooper, Me.; Danforth, Me.; Eaton, Me.; and Pembroke, Me.)
Washington County, Md. (See Clear Spring, Md.; Chewsville, Md.; Fairview, Md.; Hagerstown, Md.; Weverton, Md.; and Williamsport, Md.)
Washington County, Minn., Bass Lake. California salmon, 1877.
Washington County, Minn., Brown's Creek. California salmon, 1876.
Washington County, Minn., Butts Lake. California salmon, 1876.
Washington County, Minn., Clear Lake. California salmon, 1878.
Washington County, Minn., Cornelian Lake. California salmon, 1876, 1877.
Washington County, Minn., Eagle Lake. California salmon, 1876.
Washington County, Minn., lake. California salmon, 1876.
Washington County, Minn., Lake Elmo. California salmon, 1879.
Washington County, Minn., Lakeland. California salmon 1876.
Washington County, Minn., McKusic's Lake. California salmon, 1876, 1877.
Washington County, Minn., Marine Lake. California salmon, 1876.
Washington County, Minn., Pine Tree Lake. California salmon, 1876.
Washington County, Minn., Round Lake California salmon, 1876.
Washington County, Minn., School Section. California salmon, 1876.
Washington County, Minn., Silver Lake. California salmon, 1877, 1879.
Washington County, Minn., Square Lake. California salmon, 1876.
Washington County, Minn., Tanner's Lake. California salmon, 1878.
Washington County, Minn., Terry Lake. California salmon, 1876.
Washington County, Minn., Twin Lakes. California salmon, 1877.
Washington County, Minn. (See Lakeland, Minn.; Stillwater, Minn.)
Washington County, N. C. (See Plymouth, N. C.)
Washington County, N. Y. (See Fort Edward, N. Y.)
Washington County, R. I., Pawtucket River. California salmon, 1875; shad, 1874, 1875.
Washington County, R. I. (See Kingston, R. I.; Richmond, R. I.)
Washington County, Va. (See Saltville, Va.)
Washington County, Vt. (See Northfield, Vt.; Waterbury, Vt.)
Washington County, Vt., Kettle Pond. Schoodic salmon, 1876.
Washington County, Wis. (See Richfield, Wis.)
Washington, D. C., East Branch Potomac River. Shad, 1880. (21 items.)
Washington, D. C., Potomac River. Shad, 1878, 1880.
Washington, Kans., Mill Creek. California salmon, 1878, 1879.

Washington Lake, Le Sueur County, Minn. California salmon, 1878.
Washington, Mo., Missouri River. Shad, 1872.
Washita River. (See tributaries: Quactuto, Sabine, Saline, and Caddo Rivers.)
Washoe County, Nev. (See Reno, Nev.)
Washtenaw County, Mich., Huron River. California salmon, 1876.
Washtenaw County, Mich., Whitmore Lake. Penobscot salmon, 1873.
Washtenaw County, Mich. (See Chelsea, Mich.; Dexter, Mich.)
Watauga County, N. C., ponds. California trout, 1880.
Waterbury, Vt., Winooski River. Shad, 1877.
Wateree River, Richland County, S. C. Shad, 1880; California salmon, 1880.
Wateree River. (See tributary: Catawba River.)
Waterford, Vt., Style's Pond. Schoodic salmon, 1878.
Waterloo, Iowa, Cedar River. California salmon, 1874.
Waterville, Kans., Little Blue River. California salmon, 1878, 1879.
Waterville, Me., Kennebec River. Shad, 1874, 1880.
Waterville, Ohio, Maumee River. California salmon, 1880.
Watervliet, Mich., Big Paw-Paw River. California salmon, 1878.
Watonwan County, Minn., Long Lake. Schoodic salmon, 1879.
Watonwan County, Minn., Madelia Lake. California salmon, 1876.
Watonwan County, Minn., Saint James Lake. California salmon, 1877.
Watonwan County, Minn. (See Madelia, Minn.)
Watonwan River, Madelia, Minn. California salmon, 1877.
Watonwan River. (See tributaries: Madelia Lake, Bingham and Saint James Lakes.)
Watson Creek, Fillmore County, Minn. California salmon, 1878.
Watson Creek, North Branch of, Fillmore County, Minn. California salmon, 1878, 1878.
Watson's Island, Md., Susquehanna River. Shad, 1880 (8 items).
Waugabonig Lake, South Coventry, Conn. Schoodic salmon, 1879.
Waukesha County, Wis., Oconomowoc Lake. California salmon, 1877.
Waukesha County, Wis. (See Oconomowoc, Wis.)
Waukon, Iowa, tributary of Mississippi River. California salmon, 1875.
Waushara County, Wis., Wautoma Lake. California salmon, 1877.
Wautoma Lake, Waushara County, Wis. California salmon, 1877.
Wauwatosa, Wis., Milwaukee River. Penobscot salmon, 1873.
Waverly, Iowa, tributary of Mississippi River. Penobscot salmon, 1875.
Waverly, Md., Stoney Run. California trout, 1880.
Wayne County, Mich., Detroit River. California salmon, 1878, 1878.
Wayne County, Mich., Rogue River. California salmon, 1879.
Wayne County, Mich. (See Dearborn, Mich.; Detroit, Mich.; and Northville, Mich.)
Wayne County, Mo., Black River. California salmon, 1879.

Wayne County, Mo., Saint Francis River. California salmon, 1879.
Wayne County, Mo. (See Piedmont, Mo.)
Wayne County, N. C. (See Mount Olive, N. C.)
Wayne County, Ohio. (See Millbrook, Ohio.)
Wayne County, Pa. Schoodic salmon, 1878.
Wayne County, Pa., Jones' Lake. Schoodic salmon, 1878.
Waynesborough, Va., South River. Shad, 1878.
Weakley County, Tenn. (See Dresden, Tenn.)
Weber River, Weber County, Utah. California salmon, 1876.
Weber County, Utah, Ogden River. California salmon, 1876.
Weber County, Utah, Weber River. California salmon, 1876.
Webster City, Iowa, Boon River. California salmon, 1875.
Webster County, Mo., James River. Shad, 1879.
Webster City, Iowa, Des Moines River. California salmon, 1875.
Webster County, Iowa. (See Fort Dodge, Iowa.)
Wedge Pond, Medford, Mass. Schoodic salmon, 1876, 1877, 1880.
Wedge Pond, Winchester, Mass. Schoodic salmon, 1877, 1878, 1880.
Weitzel County, W. Va. (See Littleton, W. Va.)
Welder Lake, Cottonwood County, Minn. California salmon, 1876.
Weldon, N. C., Roanoke River. Shad, 1878, 1879, 1879, 1879.
Wellesley, Mass. Schoodic salmon, 1876.
Wellfleet, Mass., Gull Pond. Schoodic salmon, 1877, 1878.
Well's River, Vt. Penobscot salmon, 1874.
Wenham Lake, Salem, Mass. Schoodic salmon, 1878.
Wenham, Mass., Wenham Ponds. Schoodic salmon, 1878, 1879, 1880.
Wenham Ponds, Wenham, Mass. Schoodic salmon, 1878, 1879, 1880.
Wenonah, N. J., Mantua Creek. California salmon, 1877.
Wenonah, N. J., streams. California salmon, 1876, 1877.
Westborough, Mass., Hockomoco Pond. Schoodic salmon, 1879.
West Campton, N. H., tributary of Merrimack River. Penobscot salmon, 1873.
West Canada Creek, Herkimer County, N. Y. California salmon, 1874.
Western River, Cockeysville, Md. California salmon, 1876.
Westfield, Mass., Congamond Lake. Schoodic salmon, 1876, 1879, 1880.
Westfield, Mass., Westfield River. Shad, 1874, 1876.
Westfield River, Mass. Penobscot salmon, 1874.
Westfield River, Westfield, Mass. Shad, 1874, 1876.
West Hartford, Conn., reservoir. Schoodic salmon, 1879.
West Lake, Minn. California salmon, 1877.
Westminster, Md., Cobb's Branch. Schoodic salmon, 1879.
Westminster, Md., Little Pipe Creek. Schoodic salmon, 1879.
Westminster, Md., Pipe Creek. California salmon, 1876.
Westminster, Md., pond. California trout, 1880, 1880; Schoodic salmon, 1878, 1879.
Westmore, Vt., Lake Willoughby. Schoodic salmon, 1878.

Westmoreland County, Pa., Allegheny River. Schoodic salmon, 1880.
Westmoreland County, Pa. (See Donegal Pa.; Greensburgh, Pa.)
West Obion River, Paducah Junction, Tenn. Shad, 1879.
Weston, W. Va., West Fork Monongahela River. Schoodic salmon, 1879.
West Plattsburgh, N. Y., Saranac River. Penobscot salmon, 1875.
West Point, Ga., Chattahoochee River. Shad, 1877.
Westport, Conn., Saugatuck River. Penobscot salmon, 1875.
Westport, Pa., Kettle Creek. California salmon, 1878.
West River, Durham, Conn. California salmon, 1874.
West River, Northford, Conn. California salmon, 1873.
West Scituate, Mass., Scituate Ponds. Schoodic salmon, 1878, 1879.
West Skunk River, Iowa. California salmon, 1879.
West Union, Iowa, Turkey River. Penobscot salmon, 1875.
West Union, W. Va., Middle Island Creek. California salmon, 1877, 1878.
West Winsted, Conn., Long Lake. Schoodic salmon, 1878, 1879.
Wetmore, Kans., Spring Creek. California salmon, 1878, 1879.
Wetmore Lake, Allegan County, Mich. California salmon, 1879.
Wetzel County, W. Va., Fishing Creek. Schoodic salmon, 1878.
Wetzel County, W. Va. (See Burton, W. Va.)
Weverton, Md., pond. Schoodic salmon, 1878.
Weverton, Md., Potomac River. California salmon, 1876, 1877, 1878.
Wexford County, Mich., Manistee River. California salmon, 1879.
Weymouth Great Pond, South Weymouth, Mass. Schoodic salmon, 1876, 1877, 1878.
Weymouth, N. J., Great Egg Harbor River. California salmon, 1877.
Whaleysville, Md., Pocomoke River. California salmon, 1879, 1880; shad, 1879.
Wheatland, Monroe County, N. Y., Spring Brook. California salmon, 1878.
Wheeling Creek, Cold Spring, W. Va. California salmon, 1878; schoodic salmon, 1879.
Wheeling Creek, Wheeling, W. Va. California salmon, 1877.
Wheeling, W. Va., Wheeling Creek. California salmon, 1877.
Wheelock, Vt., Passumpsic tributaries. Penobscot salmon, 1874.
Whippany River, Morristown, N. J. Penobscot salmon, 1875.
White Bear Lake, Ramsey County, Minn. California salmon, 1875, 1876; Penobscot salmon, 1875; schoodic salmon, 1875, 1877.
White County, Ark., Little Red River. Shad, 1879.
Whitefish Lake, Pierson, Montcalm County, Mich. Schoodic salmon, 1878.
White Hall, Md., pond. California trout, 1880.
White Haven, Pa., Big Pond. Schoodic salmon, 1879.
White Haven, Pa., Moses Wood Pond. Schoodic salmon, 1879.
White Oak Branch, Laurel County, Ky. California salmon, 1877.

White Oak Creek, Garrard County, Ky. California salmon, 1876.
White River, Columbus, Ind. Shad, 1874.
White River, Indianapolis, Ind. California salmon, 1874; shad, 1872, 1874, 1875, 1879.
White River, Newport, Ark. California salmon, 1878, 1878; shad, 1876.
White River, Royalton, Vt. Penobscot salmon, 1874.
White River. (See tributaries: Little Red River, Black River, Currant River, James River, Big Black River, and Geneva Lake.)
White Sulphur Springs, W. Va., Dry Fork. Schoodic salmon, 1879.
Whitmore Lake, Washtenaw County, Mich. Penobscot salmon, 1873.
Whitney Ridge, Me., Seboois River. Penobscot salmon, 1874.
Whitney's Pond, Winchendon, Mass. Schoodic salmon, 1878, 1879.
Whitstone River, Columbus, Ohio. California salmon, 1878.
Wicomico Creek, Salisbury, Md. California salmon, 1879, 1880; shad, 1877, 1878, 1879.
Wicomico River. (See tributary: Wicomico Creek.)
Wicomico County, Md. (See Salisbury, Md.)
Wilbraham, Mass., Nine Mile Pond. Schoodic salmon, 1877.
Wildwood, Cook County, Ill., Calumet River. Penobscot salmon, 1874.
Wilkes Barre, Pa., Bear Lake. California salmon, 1880.
Wilkes Barre, Pa., Bowman's Run. California salmon, 1876, 1878, 1879.
Wilkes Barre, Pa., Harvey's Lake. Schoodic salmon, 1878, 1879.
Wilkin County, Minn., Red River of the North. California salmon, 1878.
Wilkin County, Minn. (See Breckenridge, Minn.)
William's Creek, Cass County, Mich. California salmon, 1875.
William's Creek, Mich. California salmon, 1874.
Williams Mill, Pa., Yellow Breeches Creek. California salmon, 1874, 1875, 1876, 1878, 1879.
Williamson County, Ill. (See Marion, Ill.)
Williams Pond, Grant County, W. Va. California salmon, 1879, 1880.
Williamsport, Md., Conococheague River. California salmon, 1876.
Williamsport, Pa., Trout Run. California salmon, 1879.
Williamsport, W. Va., Williams Spring. Schoodic salmon, 1879.
Williams Spring, Williamsport, W. Va. Schoodic salmon, 1879.
Williamstown, N. J., Great Egg Harbor River. California salmon, 1876.
Willimantic, Conn., brooks tributary to Thames River. Schoodic salmon, 1878, 1879.
Willimantic, Conn., Shetucket River. Penobscot salmon, 1875.
Willoughby Lake, Westmore, Vt. Schoodic salmon, 1878.
Willow Brook, Minn., ponds. California trout, 1880.
Willow Brook, Sayville, N. Y. California salmon, 1876, 1877.
Willow Creek, Fillmore County, Minn. California salmon, 1878.
Willow River, Clear Lake, Wis. California salmon, 1879.
Wills Creek, Jennings Run, Md. California salmon, 1874.

Wilmar, Minn. Penobscot salmon, 1875.
Wilmington, Del., Christiana Creek. Shad, 1880.
Wilna, Md., Plum Tree Run. California trout, 1880.
Wilna, Md., Winters Run. California salmon, 1879; Schoodic salmon, 1880.
Wilson Brook, Dodge County, Minn. California salmon, 1878.
Wilson County, N. C., Contentnea Creek. Shad, 1877.
Wilson, Kans., pond. Schoodic salmon, 1880.
Wilton, Iowa, Cedar River. California salmon, 1875.
Winchendon, Mass., Dennison's Lake. Schoodic salmon, 1876, 1877, 1878, 1879.
Winchendon, Mass., Whitney's Pond. Schoodic salmon, 1878, 1879.
Winchester, Mass., Mystic Lake. Schoodic salmon, 1877, 1878, 1880.
Winchester, Mass., Wedge Pond. Schoodic salmon, 1876, 1877, 1878, 1880.
Winchester, Va., Cedar Creek. California salmon, 1874.
Windham, Conn., Shetucket Waters. Schoodic salmon, 1876.
Windham County, Conn. (See Canterbury, Conn.; North Windham, Conn.; Putnam, Conn.; South Windham, Conn.; Voluntown, Conn.; Willimantic, Conn.; Windham, Conn.)
Windham County, Vt. (See Bellows Falls, Vt.; Rockingham, Vt.; South Vernon, Vt.)
Windom Lake, Cottonwood County, Minn. California salmon, 1876.
Windom, Minn., Des Moines River. California salmon, 1877.
Windsor, Conn., Scantic River. Schoodic salmon, 1880.
Windsor County, Vt. (See Royalton, Vt.)
Winn, Me., Penobscot River. Penobscot salmon, 1876.
Winnebago County, Ill. (See Burritt, Ill.; Owen, Ill.; Rockford, Ill.)
Winnepeg Lake. (See tributary: Red River of the North.)
Winneshiek County, Iowa. (See Decorah, Iowa.)
Winnesquam Lake, N. C. Schoodic salmon, 1880.
Winnipesaukee River, Tilton, N. C. Shad, 1877.
Winnipiseogee Lake, Centre Harbor, N. H. Schoodic salmon, 1879.
Winnipiseogee Lake. (See tributary: Smith's Pond.)
Winona County, Minn., Brown's Mill Pond. California salmon, 1878.
Winona County, Minn., Ferguson Creek. California salmon, 1878.
Winona County, Minn., Pine Creek. California salmon, 1878.
Winooski River, Vt. Penobscot salmon, 1873.
Winooski River, Burlington, Vt. Shad, 1873.
Winooski River, Essex, Vt. Schoodic salmon, 1876.
Winooski River, Waterbury, Vt. Shad, 1877.
Winooski River, Winooski, Vt. Shad, 1874, 1874.
Winslow, N. J., Great Egg Harbor River. California salmon, 1877.
Winsted, Conn., Long Lake. Schoodic salmon, 1876, 1877.
Winter's Run, Harford County, Md. California salmon, 1877.
Winter's Run, Magnolia, Md. California salmon, 1876.

Winter's Run, Wilna, Md. California salmon, 1879; Schoodic salmon, 1880.

Wisconsin River. (See tributaries: Spirit Lake, Streams, Spring Creek, Silver Lake, Lemonweir River.)

Wisconsin River, tributaries of, Hartman Wis. California salmon, 1878.

Wisconsin River, tributaries of, Poynette, Wis. California salmon, 1878.

Wisconsin River, Wis. California salmon, 1878.

Withington Lake, Crow Wing County, Minn. Penobscot salmon, 1875.

Wolfborough, N. H., Smith's Pond. California salmon, 1879.

Wolf River, Memphis, Tenn. California salmon, 1875.

Woodbridge, Conn., Valley Pond. Schoodic salmon, 1877, 1878.

Woodburn Lake, Dexter, Mich. Whitefish, 1876.

Woodbury, Conn., Pomparaug River. Schoodic salmon, 1880.

Woodbury County, Iowa. (See Sioux City, Iowa.)

Woodbury Creek, Woodbury, N. J. California salmon, 1877.

Woodbury, N. J., Timber Creek. California salmon, 1877.

Woodbury, N. J., Woodbury Creek. California salmon, 1877.

Wood County, Tex. (See Mineola, Tex.)

Wood County, W. Va. (See Parkersburgh, W. Va.)

Woodford County, Ky., Dunlap's Branch. California salmon, 1876.

Woodford County, Ky., ponds. California salmon, 1878, 1878.

Woodford County, Ky., South Elkhorn. California salmon, 1877.

Woodford County, Ky. (See Versailles, Ky.)

Woodhull Lake, Herkimer County, N. Y. Schoodic salmon, 1879.

Wood River, R. I. California salmon, 1875.

Wood's Lake, Kalamazoo County, Mich. California salmon, 1875.

Woodstock, Lenawee County, Mich. Goose Lake, California salmon, 1878.

Woodstock, Lenawee County, Mich., Mallory Lake. California salmon, 1878.

Woodstock, Lenawee County, Mich., Silver Lake. California salmon, 1878.

Woodstock, Lenawee County, Mich., Tiffin River. California salmon, 1878.

Woodstock, N. H., headwaters of Merrimack River. Penobscot salmon, 1873.

Woodstown, N. J., Salem Creek. California salmon, 1876.

Woodward's Aquarium, San Francisco, Cal. Schoodic salmon, 1878.

Worcester County, Md. (See Berlin, Md.; Mitchell's Bridge, Md.; Pocomoke City, Md.; Snow Hill, Md.; Whaleysville, Md.)

Worcester County, Mass. (See Ashburnham, Mass.; Athol, Mass.; Berlin, Mass.; Harvard, Mass.; Hubbardston, Mass.; Lancaster, Mass.; Lunenburgh, Mass.; Mendon, Mass.; Milford, Mass.; Millbury, Mass.; Paxton, Mass.; Westborough, Mass.; Winchendon, Mass.)

Worthington, Iowa, Maquoketa River. California salmon, 1875.

Worthington, Iowa, North Maquoketa River. Penobscot salmon, 1875.

Wright County, Minn., Baytown Lake. California salmon, 1876.

Wright County, Minn., Howard Lake. Penobscot salmon, 1875.
Wright County, Minn., lakes. California salmon, 1879.
Wright County, Minn., Lake Charlotte. California salmon, 1877.
Wright County, Minn., Pulaski Lake. California salmon, 1877.
Wright County, Minn., Sugar Lake. California salmon, 1877.
Wright Pond, Holyoke, Mass. Schoodic salmon, 1879.
Wye Mills Creek, Cordova Station, Md. Shad, 1879.
Wythe County, Va., Barret's Pond. Schoodic salmon, 1880.
Wythe County, Va., ponds. Schoodic salmon, 1880.
Wythe County, Va., Reed Creek. California salmon, 1879.
Wythe County, Va., Totes Run. California salmon, 1879.
Wythe County, Va. (See Lead Mines, Va.; Wytheville, Va.)
Wytheville, Va., New River. Schoodic salmon, 1877,1878, 1880.
Wytheville, Va., Totes Run. California salmon, 1880.
Yadkin River, Rowan County, N. C. Shad, 1877.
Yadkin River, Patterson's, Caldwell County, N. C. California salmon, 1878, 1878, 1879.
Yadkin River, ponds tributary to, Salisbury, Rowan County, N. C. Schoodic salmon, 1878.
Yadkin River, Salisbury, N. C. California salmon, 1877. 1877. 1879; shad, 1878, 1879.
Yalabusha River, Grenada, Miss. Shad, 1878, 1879.
Yarmouth, Mass., pond. Schoodic salmon, 1880.
Yazoo County, Miss. (See Vaughan, Miss.)
Yazoo River, Abbeville, Miss. California salmon, 1876, 1876; shad, 1876.
Yazoo River. (See tributaries: Sunflower, Coldwater, Tallahatchie, Yalabusha, and Yocana Rivers.)
Yellow Breeches Creek, Mechanicsburgh, Pa. California salmon, 1873.
Yellow Breeches Creek, Williams Mill, Pa. California salmon, 1874, 1875, 1876, 1878, 1879.
Yellow River, Conyers, Ga. Shad, 1879.
Yellow River, Covington, Ga. California salmon, 1878; shad, 1880.
Yerke's Lake, Northville, Mich. Whitefish, 1876.
Yocana River, La Fayette County, Miss. Shad, 1879.
York County, S. C. (See Rock Hill, S. C.)
York River. (See tributary: Mattapony River.)
York Road, Md., pond. California trout, 1880; Schoodic salmon, 1880.
Youghiogheny River, Deer Park, Md. California salmon, 1877.
Youghiogheny River, Oakland, Md. California salmon, 1876.
Youghiogheny River. (See tributary: Little Youghiogheny River.)
Zalman's, Va. (See Buffalo Mills, Va.)
Zanesville, Ohio, Muskingum River. Shad, 1876.
Zumbro River, Mazeppa, Minn. California salmon, 1876, 1878.
Zumbro River, North Branch, Wabasha County, Minn. California salmon, 1878.
Zumbro River, South Branch, Rochester, Minn. California salmon, 1877.

XX.—REPORT OF WORK AT THE UNITED STATES HATCHERY, NORTHVILLE, MICH., 1881–'82.

By Frank N. Clark.

The following report, in connection with the work of this station, for the year ending June 30, 1882, is respectfully submitted.

The work performed during the period covered by this report includes the collection and subsequent disposition of the eggs or fry proceeding from 22,500,000 eggs of whitefish (*Coregonus albus*); 140,000 eggs of brook trout (*Salvelinus fontinalis*) from the ponds of this station; about 5,000 eggs of the red-banded or rainbow trout of California (*Salmo iridea*), also from the ponds of this station, and 57,000 eggs of lake trout (*Cristivomer namaycush*); the forwarding of 75,000 eggs of California trout received from the United States station at Baird, Cal., and the care and disposal of the resultant fry; the forwarding of 46,500 eggs of Schoodic salmon received from the United States station at Grand Lake Stream, Me., and the distribution of the fry; and the distribution of 1,500 young carp received from the national carp ponds at Washington.

In addition to this work, the old trout ponds were reconstructed and reoutlined during the months of September and October, and an additional pond built to accommodate the increased stock of breeders. A survey of the premises was made in July, and a map of the same, showing the proposed improvements, was soon after submitted to the United States Commissioner.

For the purpose of creating a large stock of parent fish from which to supply the increasing demand for eggs of California trout, several thousand of the young of these fish were retained from the lot hatched in February and March of the present year, and 12 new tanks fitted for their temporary accommodation. Anticipating the increased accommodations required by these fish later on, excavations for three new ponds were begun in April, and these are now nearly completed.

During the first two months of the year under consideration—July and August—no special work was carried forward, the time being occupied with work that is, for the most part, current throughout the year. This includes the preparing and dispensing of aliment to the growing and adult fish; devising and executing plans for their protection from poachers; affording to the relatively smaller fishes protection

from their greatest enemies—the larger ones—by keeping them assorted according to size, irrespective of age; directing and equalizing the inflow of water proportionate to the number and size of the fishes in each pond; guarding all possible avenues of escape of the fishes from one pond to another, as well as into the waste channel, and in removing the masses and collections of the ever-generating algæ floating against and clogging the screens—a source of great annoyance on hot, sunny days that are especially favorable to its formation.

At the hatchery, but little preparation for the hatching season was necessary, everything having been put in order at the close of this branch of work in April, 1881, and left in readiness to resume operations again at the proper time. The few essential preliminaries in this direction, as well as in connection with the water facilities and adjuncts, were therefore arranged in September and October, cotemporaneously with the work of revising the trout ponds.

As the estimates contemplated increased work in the way of propagating whitefish, increased hatching capacity was provided by displacing a double row of hatching-boxes with a tier of tanks, which were subsequently equipped with hatching-jars.

Possible and manifestly weak places in connection with the spring pond and its three outlets were repaired and strengthened to better guard against leakage and imminence of danger of outbursts. The discharging channels alluded to provide for drainage, for overflow, and for conveying the water to the reservoir from which the tank room is supplied. Being made of wood and laid underground, they have usually lasted not to exceed 4 or 5 years, and, in spite of their being thoroughly caulked when laid, leak more or less after a time. Then, the draught-pipe between the spring pond and reservoir must, of necessity, pierce the dam near its surface to give sufficient head of water in the hatchery, and, being so near the surface, has been lifted from its bed by upheavals of frost, the water percolating underneath. The overflow being still nearer the top of the dam is even more liable to be thus forced from position; and nothing short of constant vigilance at times has prevented the water getting sufficient start in this way to wash a gorge across the highway that creates the dam, which would soon draw the pond below the draught pipe, and thus discontinue the supply for the hatchery. The overflow in use having become quite unserviceable through age, I decided to guard against further insecurity at this point by replacing it with pipes of iron firmly imbedded in cement and gravel. This was accordingly done, and no further trouble from this source is anticipated. The drainage and draught pipes, after being thoroughly caulked, were considered safe for another season—the one just closed. But as there is now more or less leakage, which is a constant menace to the safety of the dam, and as it is important to secure immunity from danger of destroying the water power during the hatching period, these must also be replaced by iron conductors of sufficient caliber for the purpose,

surrounded by an impervious mass of cement and gravel. Until this is done it will not be possible to command the entire yield of the supplying springs, nor to dictate through what channels the water shall be discharged.

The cooling or intermediate reservoir between the spring pond and hatchery had been leaking quite too freely to be compatible with safety, so that repairs were considered essential. We therefore girted it with a 10-inch band or rim of 2-inch planking, the water level touching the middle of the rim, while the planks themselves are firmly held against the outer wall by spikes driven to stakes set in front. Then, a double coat of cement, lapping on the edge of this rim and covering the entire interior surface of the reservoir, was spread, thus effectually closing all possible chances for leakage. The test of eight months' use of this receptacle has shown it to be absolutely water-tight and perfectly safe.

NOTES AND TABLES IN REFERENCE TO COLLECTING THE SUPPLY OF WHITEFISH EGGS.

Most of the eggs laid in were secured at the "Bass" islands of Lake Erie, which are, on the whole, quite as reliable as any locality for this work. Certain other points in Lake Erie, as well as in Lakes Huron and Michigan, may show heavier catches of fish, but they are, so far as I have been able to ascertain, less prolific of ripe fish, in proportion to the number caught. At the islands, too, as well as at all other points, the yield of eggs from the various fisheries is quite disproportionate to the catch of adult fish. The fact that whitefish are caught in any given locality during their nominal spawning period does not necessarily signify that ripe fish will be found at such places, for the devices for their capture—the stationary trap net or portable gill-net—may not be set on or near those grounds naturally selected by the fish for the deposition of spawn, but at points in the paths or runways leading to and quite remote from the objective point of the fish in their migrations from the feeding to the spawning grounds. From these nets ripe fish are found, if at all, with the exception of an occasional straggler, in the later runs at the last of the season. Such fisheries, although quite profitable for the fishermen, are generally unreliable for the collection of spawn, especially when adverse weather compels a suspension of work before the last migrations occur.

There are certain spawning grounds in the vicinity of the islands that can invariably be depended on. These are well known, and have become favorites with the spawn-gatherers, not only because of their reliability and certainty of being visited by schools of ripe fish, but ripe fish usually appear several days earlier than at other points, some of which furnish heavier catches. Indeed, the privilege of collecting eggs from the nets set on these fruitful grounds is so much sought after by the representatives of various fish commissions that, naturally enough, considerable rivalry for the control thereof is developed. Naturally

enough, too, the State commissions can wield a greater influence than others over net-owners, their work being practically of a local character, and carried on for the express purpose of increasing the stock of fishes by propagation.

Notwithstanding this opposition, however, I arranged with Messrs. Snide and Fox, of North Bass Island, for the eggs from their three trap-nets, which were established on spawning grounds not surpassed by any in Lake Erie. Fourteen and a half million eggs were taken from these three nets, or nearly 5,000,000 to the net, as will be seen by referring to the tables. A glance at the tables will show also that eggs were taken here seven days earlier than at Middle Bass Island, and eight days earlier than at Kelley's Island.

Four nets were worked at each of the last two islands mentioned, the former yielding 1,000,000 to the net and the latter about 650,000.

During the fall season whitefish and herring comprise the great mass of fish caught at the islands, or, for that matter, throughout Lake Erie. Indeed, the combined catch of all other kinds is insignificant in comparison.

The lake remained open much later than the preceding season (1880), increasing the product of the fisheries to correspond. Notwithstanding this, however, the greater demand and brisker competition of buyers combined to produce a decided advance in prices. Thus in the fall of 1880 the fishermen received 3¼ to 3½ cents per pound for whitefish and 50 cents per hundred weight for herring, while during the period under consideration they received 4¼ to 4½ cents for whitefish and 75 cents to $1 for herring.

Pending the appearance of ripe fish the "egg-man" must bide his time with patience, disposing of the time which would otherwise hang heavily in collecting notes by the wayside, and making frequent tours of the docks as the fish-boats come in to note the condition and catch of fish, often being compelled, through courtesy, to listen to the oft-repeated tale of some superannuated fisherman, who tells what "piles" of fish *he* used to catch in "them days," such fabulous figures being noted as to induce the belief that the original number had increased in geometrical progression through the intervening years.

Following are the tables of spawn-taking operations at North Bass, Middle Bass, and Kelley's Island:

AT NORTH BASS.

Date.	Females used.	Males used.	Number eggs taken.
Nov. 10	1	3	15,000
11	4	10	45,000
13	12	18	250,000
14	34	50	640,000
16	49	60	960,000
18	45	80	950,000
20	50	70	1,000,000
21	90	120	2,000,000
22	53	100	1,250,000

AT NORTH BASS—Continued.

Date.	Females used.	Males used.	Number eggs taken.
Nov. 23	40	65	900,000
26	58	85	1,250,000
27	85	110	1,825,000
28	20	25	375,000
29	24	34	450,000
30	28	40	500,000
Dec. 1	26	50	450,000
2	38	45	800,000
3	20	25	440,000
4	18	22	300,000
5	6	9	100,000
Total			14,500,000

AT MIDDLE BASS.

Nov. 17	18	35	400,000
18	16	35	325,000
20	30	50	550,000
21	18	32	325,000
23	32	48	650,000
26	40	55	725,000
27	20	60	475,000
28	22	38	450,000
30	6	13	100,000
Total			4,000,000

AT KELLEY'S ISLAND.

Nov. 18	6	10	125,000
19	5	10	75,000
20	10	18	200,000
22	16	28	300,000
23	42	70	850,000
25	25	40	450,000
26	21	36	400,000
Dec. 1	4	10	100,000
3	4	9	75,000
Total			2,575,000

The eggs were packed and conveyed to the hatchery in the flannel-tray shipping-cases, substantially in the same manner noted in my last report (1880–'81).

At Alpena, Mich., whence I anticipated receiving a large number of eggs, a very decidedly off year for the fishermen, and in consequence for the spawn-gatherer, was experienced. The continued warm weather of October and November delayed the cooling of the water to that degree necessary to drive the fish from the deep waters to the shoals and reefs for the purpose of spawning, until near the usual time for winter to set in; so that the fishermen, fearing a repetition of the experiences of the preceding season, when winter was precipitated upon them so suddenly that a large amount of fishing appurtenances were frozen in and destroyed, entailing heavy losses, were affrighted at the first cold snap, and had relegated all their paraphernalia to winter quarters before the ebb-tide of whitefish—the fisherman's bonanza—had set in.

In this section the first runs during the fall season are made up almost wholly of lake trout (*Cristicomer namaycush*), and usually a sufficient number are caught to compensate for cost of fitting up and setting the nets and current operating expenses, leaving the measure of profits to be determined by the length of time the work can hold out against the weather during the whitefish run. This would seem to be and invariably is sufficient inducement to incur the taking of great risks; but the fishermen seemed only to remember the disasters and losses of the previous season, forgetting that the early and intense cold of that period was quite exceptional. A feeling of overcaution was produced, manifested by the great haste of interested parties to consign their trappings to the protection of harbors and twine-houses. But as day after day of moderate weather—for the time of year—followed the first blizzard, they saw how premature their alarm had been, and it is safe to predict for the coming season a relapse into the other extreme of an entire disregard of the premonitions of winter.

The season could doubtless have been made a successful one for both fisherman and spawn-taker, as the weather was such as to admit of a continuance of operations long after the field was abandoned. Even as it was, fishing was carried on ten days later than last year, but should have continued still fifteen days longer to correspond with the weather and runs of fish. The number of whitefish actually brought to port at Alpena during the season was quite insignificant compared with some former years, and a very decided falling off from the average. Of course quite a large number were caught in the aggregate, from which many millions of eggs might have been obtained had there been a heavy sprinkling of ripe spawners; but only the advance guard was captured, and this is invariably made up of a great preponderance of males—mostly ripe—and a few unripe females. Just as mature spawners began to appear, a brief period of severe weather came on, nets were withdrawn as rapidly as possible, so that eggs were taken only on four days, and then in insignificant numbers, with one exception. In no other branch of the work is success or failure so dependent upon and associated with the condition of the weather.

Certain well-known and well-defined localities are sure to receive the annual visitations of hordes of whitefish laden with spawn; but as the climax of their spawning period is reached only at the verge of winter, when the elements are liable at any time to combine to prevent their capture, a considerable degree of uncertainty in regard to laying in a very large number of eggs is of necessity unavoidable.

However, I can but regard Alpena and vicinity as a favorable locality for the collection of whitefish eggs. Large numbers of the parent fish are captured, and very rarely, indeed, are the fisheries abandoned before the height of the spawning season is reached. This fact, coupled with the great fecundity of the fish, makes it a matter of comparative ease to obtain vast numbers of eggs under favorable circumstances. Having

plenty of ripe fish at command, one man can readily take two or three million eggs daily. I have taken, on more than one occasion, under partial adverse circumstances, 2,000,000 eggs in a day. It will be seen, then, that but few days in the aggregate, *at the right time*, are required to secure great numbers. Indeed, taking the seasons as they average, only a small corps of spawn-gatherers are necessary to collect any reasonable number of eggs.

Mr. Wires, with one assistant, obtained eggs as follows:

Nov. 16	25,000	from 2 females.
Nov. 19	100,000	from 6 females.
Nov. 20	100,000	from 7 females.
Nov. 21	200,000	from 11 females.
Nov. 22	1,000,000	from 40 females.

Those taken November 16 were from trap-nets, the remainder from gill-nets. Besides the 1,425,000 whitefish eggs taken and sent on to Northville in good condition by Mr. Wires, some 60,000 eggs of lake trout were taken from 10 spawners on the last day of October, and forwarded to Northville in good shape the day following.

Below is Mr. Wires's record of temperatures and weather observations made each day at 12 m.:

Date.	Temperature of air.	Temperature of water.	Direction of wind.	Intensity.	Condition of sky.	Remarks.
1881.	°	°				
Oct. 28	48	50	S.	High	Cloudy	Raining nearly all day.
29	56	50	SE.	do	Clear	Went out with fishing tug Seawing.
30	46	50	W.	Fresh	Cloudy	Do.
31	48	50	N.	Light	Clear	Do.
Nov. 1	50	50	S.	do	do	Remained at Alpena.
2	49	49	SE.	Fresh	Cloudy	Went out with the Seawing.
3	41	48	SW.	Strong	do	Light snow-storm. Visited Partridge Point fishing grounds.
4	30	47	NW.	do	do	Raining. Aboard the Seawing.
5	34	47	NE.	do	do	Stormy. At Alpena.
6	54	47	S.	Fresh	Clear	Went to Scarecrow Island.
7	50	47	SE.	do	Cloudy	Went to North Point.
8	49	47	S.	Very strong	do	Blowing a gale; no nets lifted.
9	46	46	W	Strong	do	At Alpena. No spawning whitefish found yet.
10	38	46	W.	Fresh	do	Do.
11	39	46	E.	Light	do	Do.
12	43	46	W.	Strong	do	Squally. Aboard the fishing tug Grayling.
13	41	45	NW.	Light	do	At Alpena.
14	38	44	SW.	Strong	do	Snowing. At Partridge Point.
15	26	40	W.	do	do	Went to fishing grounds at Ossineke.
16	36	40	W.	Light	do	First eggs of white-fish taken at Ossineke.
17	48	40	SW.	Very strong	do	Blowing a gale; no nets lifted.
18	30	39	W.	Strong	do	Trap nets being taken up at Ossineke.
19	30	38	N.	do	do	Cold rain and sleet. Aboard the Seawing.
20	24	37	SW.	do	do	Storming. Aboard the Seawing.
21	30	37	NW.	do	do	Do.

Date.	Temperature of air.	Temperature of water.	Direction of wind.	Intensity.	Condition of sky.	Remarks.
1881.	°	°				
Nov. 22	25	36	SE.	Light	do	Aboard the Tom Merrill.
23	46	36	SW.	Very strong	do	Blowing a gale. Boats remained in port.
24	18	34	W.	Strong	do	Do.
25	24	33	SW.	do	do	Blowing strong. Boats remained in port.
26	30	33	NW.	do	do	Went out with the Tom Merrill. Fish in nets mostly dead; nets not reset.
27	23	32½	NW.	do	do	At Alpena. Nets of all kinds being withdrawn as fast as weather will permit.
28	35	32½	S.	do	Clear	Do.
29	48	32½	SW.	do	do	Do.
30	34	32½	E.	Light		Squalls of snow and sleet.

NOTE.—Left Alpena for Northville December 2, arriving the day following.

OPERATIONS AT THE HATCHERY.—DISTRIBUTION OF EGGS AND FRY.

Twenty-two million five hundred thousand eggs were shipped from the spawning grounds, all arriving at the hatchery in good condition. The first lot came from the islands November 21, and the last lot from the same source December 8. Upon arrival the eggs are washed from the trays of each case successively into a tub of water, and dipped thence with a skimmer into the hatching jars. All the jars on hand were filled before the last shipment of eggs but one came to hand from the spawning grounds. Pending the arrival of a number of jars daily expected, the eggs of this lot were allowed to remain in the shipping cases, which were placed in a room varying in temperature from 38° to 55°. The jars soon came along, but some little time was consumed in fitting them up for the reception of eggs; so that ten days had elapsed from the time the eggs were arranged in the cases at the islands until their removal therefrom at the hatchery, yet no special loss on this account was shown. Up to this time the eggs remained nearly intact, although conferva had begun to develop from the dead eggs. However, a few matted chunks adhered to the trays when emptied, and these, with others rapidly forming, would soon have caused serious loss had they been allowed to remain undisturbed much longer.

For experiment, we took from this lot of eggs as soon as they reached the hatchery about 25,000, and placed them in a hatching box, where, of course, the water is constantly renewed, but the eggs themselves lie nearly or quite motionless on the trays. Here we allowed them to remain 7 days without removing the dead eggs. At the end of this time they had collected in masses and bunches, scarcely any remaining that were not held by the outreaching fingers of conferva. Fully one-half were already destroyed, and we succeeded in saving a portion of the

remainder only by agitating the collections and chunks violently in water, passing the freed eggs through a sieve. The results serve only to verify prior experiments, which show that the greatest enemy of the egg—conferva—generates much faster in water than in atmosphere of the same or even a higher temperature, and that in consequence eggs are far safer out of water than in unless provision for the removal of the confervaceous egg is made. For incubating the eggs, the Chase automatic jar was used, 136 being required at first. They were arranged as follows:

84 jars, at 175,000 each	14,700,000
52 jars, at 150,000 each	7,800,000
	22,500,000

The number of eggs the jar will contain while in operation is in an inverse ratio to the volume of water used. When the minimum of water is used, or just barely enough to impart sufficient motion to the eggs to keep them detached, the jars will hold 175,000 eggs each. Well-filled jars, with a gentle circulation, work much better than those partially filled and given a brisk or violent action; in fact, the former show the very best movement obtainable. But jars to be operated in this way must be perfect in form and have evenly ground tubes, otherwise no motion whatever will be imparted to a portion of the eggs. Then, too, if there is a considerable sprinkling of dead eggs—frequently the case at the beginning of the season—a gentle movement will not always prevent the putrid eggs from uniting or collecting in chunks or masses, which will settle to the bottom of the jar instead of being thrown off. For this reason "Hospital" jars have to be given a liberal supply of water in the shape of very energetic currents.

Several experiments were made with a view to improving on the hatchers in use. The "Improved Shad Hatcher," described in Forest and Stream of June 16, 1881, was tried and found to give a more perfect movement to the eggs than the Chase jar. To secure this, however, either a greater volume or head of water was required, owing to the force of the current as it entered the jar being partially arrested in the hollow of the upright cup or cone.

To overcome this drawback, Assistant Bower advised the use of a solid double cone, the inverted section of which would simply divert or radiate the water without breaking its force, and by its own weight retain its position. The suggestion being acted upon, an equalized current compelling a uniform and perfect movement of the eggs was produced, with the minimum supply of water.

Into this jar or hatcher the water is introduced at the bottom; in the Chase jar at the top, being directed to the bottom by a glass tube resting on feet, which frequently obstruct and disconcert the currents throughout the egg-chamber. Assistant Wires succeeded in amending this defect, thereby greatly improving the efficiency of the Chase in-

strument, by using a tin tube with a wide flange or rim at the bottom, conical in shape to conform to the lower section of the above-mentioned double cone over which it was set, the cone being inverted so that the strips of tin serving as feet when used with the other jar, would raise the tube to allow the water to escape uniformly from the outer edge of its flange or rim.

Mr. Bower also fitted up a rectangular box or tank for an incubator, so constructed that the eggs rise from the center and settle down the outside, exactly reversing the jar movement. It is 12 inches wide, 13 deep, and 30 long, although its length might be extended indefinitely without disturbing or changing its operation. It is divided into upper and lower sections, and, as with the jars, a water-pressure or head is required. The desired movement of the eggs is obtained by introducing the water into the lower section, whence it is admitted to the upper section, which is the egg-chamber, through a sixteenth-inch crevice running lengthwise of the box. From either side and 6 inches from the top the partition which divides the box into two sections slants downward to converge the eggs to the center where the current forced through the crevice carries them up again to settle back, fountain-like, as before. Overflows with wire gates are provided at intervals around the top of the box. This apparatus was not tried until the eggs had already begun hatching, so that no opportunity to correct its faults by a practical test was given. It worked very well, however, although after trying it we were well satisfied that it should be given greater depth, less width, and a greater head of water. Doubtless a little more experimenting with this or a similar device will produce an incubator that will be entirely satisfactory, as the principles by which the water currents are obtained and controlled are correct; while it would have the merit of being easily operated, and furnishing capacity for many millions of eggs at a merely nominal cost.

Spring water alone is used for hatching purposes at this station, and where it first issues from the earth varies but little from a temperature of 47°. In consequence of the very moderate weather which prevailed the past winter, our arrangements for securing a lower temperature—continued exposure to the air before reaching the hatchery—were of little avail. The eggs, therefore, progressed very rapidly from the first until all were hatched.

The first orders for whitefish eggs to be filled were from Herr von Behr and G. Ebrecht, Germany. The eggs were packed in separate cases and started on their journey December 19, consigned to Fred. Mather, Newark, N. J., whence they were reshipped to destination. These and subsequent lots were prepared for shipping substantially as follows: First, a sufficient number of trays of canton flannel are made, also a substantial case for the same, of the proper size to allow 4 to 6 inches space all around for the packing material. The trays are then anchored in a tank of water. A quantity of eggs are transferred from

the hatching vessels to a number of wire trays in the picking trough, and carefully feathered over to show up the dead and unimpregnated eggs, which are removed with nippers. After collecting the eggs by overturning and submerging the trays into a large tin vessel partially filled with water, they are skimmed up and measured in an 8-ounce graduate (equivalent to 10,000 eggs) and poured thence into the shipping trays. These are then removed to the packing room, or where the temperature is between 30° and 40° Fahrenheit, tilted and drained, and the eggs spread with a feather uniformly two layers in depth, a half inch margin being left around the outside. A single fold of dampened millinet is then thrown over the eggs, and a sufficient quantity of live moss, previously picked, washed and wrung out just enough to prevent dripping or drainage, piled on to fill the tray when rather snugly pressed down. When practicable, the trays are allowed to stand a few moments in a temperature of 27° to 32°, or until needles of ice have begun to form in the moss, then placed one above the other and firmly held to position by cleats nailed to top and bottom boards. The package is then transferred to the shipping case, having a 4-inch coating of fine, dry, hardwood shavings in the bottom, and surrounded with the same material quite firmly pressed in. The case is now soon ready for its journey, not, however, until the usual printed instructions and precautions to express messengers are pasted to the cover, and which, if observed and heeded, would deliver the eggs to consignees in practically the same condition as when packed ninety-nine times out of a hundred.

Following is the table of shipments:

Date.	Number of eggs shipped.	Consignees.
1881.		
December 19	300,000	F. Mather, Newark, N. J., for von Behr, Germany.
19	12,000	F. Mather, Newark, N. J., for G. Ebrecht, Germany.
23	250,000	B. B. Redding, California.
24	250,000	Do.
31	10,000	Prof. S. F. Baird, Washington, D. C.
1882.		
January 7	250,000	F. Mather, Newark, N. J., for France.
13	500,000	B. F. Shaw, Iowa.
16	10,000	H. J. Fenton, Connecticut.
29	250,000	B. B. Redding, California.
31	100,000	Prof. S. F. Baird, Washington, D. C.
31	100,000	Mrs. J. H. Slack, New Jersey.
Total	2,032,000	

I am unable to report the condition in which the transatlantic shipments reached their destination, correspondence relating thereto having been made directly with the United States Commissioner, or with Mr. Mather. Indirectly, however, or from Circular No. 1, 1882, of the German Fishery Association, I learn that the whitefish eggs arrived "in the very finest condition, fine beyond comparison"; from the same source,

also, that of the 20,000 lake trout eggs shipped from Northville, December 10, "only 100 were dead."

Mr. Redding reported that the two lots of a quarter million each, shipped December 23 and 24, arrived at San Leandro, Cal., ten days later, in rather poor condition; accounted for in part by their having taken the Southern Pacific Road, which passes through a warmer climate, besides being four days longer in transit than if they had gone over the Central Pacific. The third quarter-million lot, consigned from Northville January 3, arrived at San Leandro in very good condition. Mr. Woodbury, superintendent of the San Leandro hatchery, reported the hatching of 90 per cent. of this lot, and about 35 per cent. of the others, the fish being planted as follows:

Jan.	19—Donner and Tahoe Lakes	75,000
	30—Shafters Lake (Marin County)	5,000
Feb.	1—Clear Lake, Lake County	75,000
March	7—Concow Lake, Butte County	10,000
	4—Lake Tahoe, Placer County	100,000
	9—Clear Lake, Lake County	100,000
	10—Radcliff Lake, Santa Cruz County	20,000
	11—Lake Chabot, Alameda County	5,000
		390,000

Mr. B. F. Shaw, Commissioner of Fisheries, reported that 75 per cent. of the eggs sent him for the State of Iowa hatched, and that the minnows were released in Lake Okibozi and Spirit Lake, Iowa.

Mr. Fenton reported that the 10,000 eggs forwarded him for the State of Connecticut arrived January 20, and upon opening the package about 2,000 of them were found frozen to death. The subsequent loss was a little over 900, leaving about 7,000 fish, which were set free in Long Lake, Litchfield County, Connecticut.

Mr. Anderson, who had charge of the hatchery of the New Jersey Commission, in which the eggs consigned to Mrs. Slack were developed, reported that the eggs reached Bloomsburg February 3, at 4.39 p. m., in very good condition. About 90 per cent. were hatched by the 11th of February, or 90,000 fish in all, of which one-half were liberated in Shepherd's Lake, and the remainder in Greenwood Lake.

At the Northville hatchery the fish began hatching from the oldest eggs January 27, and all were out by the 25th of February. At least three-fourths of them hatched between the 6th and 12th of the latter month, taxing the capacity of the receiving tanks to their utmost. Perforated tin boxes are fitted to these tanks near the overflows, to keep the fish away from the currents at that point, which would be too strong for them to resist. They are also provided with compartments which are supposed to catch the shells; but while the fish were hatching so freely, a sufficient number of shells would float over these divisions to

clog the screen-boxes every few moments, so that unremitting attention was demanded day and night to keep the outlets unimpeded.

The United States Fish Commission car, with Messrs. Ellis, Moore, and Simmons to assist in the work of distributing and planting the minnows, reached Northville February 3. Arrangements for the gratuitous transportation of the car and its messengers having previously been made with all the railroad companies, with one exception, whose lines were to be traversed, the distribution proceeded smoothly and with little expense from the initial trip, February 7, until the successful termination of the work, March 2. Much credit is due Mr. Ellis, who had charge of the trips, and also to his experienced assistants. The car itself was also a great convenience, as well as an important and efficient factor in carrying forward this work.

Following are the railroad companies to whom acknowledgments are due for free transportation of car and messengers: The Flint and Pere Marquette; Michigan Central; Chicago and West Michigan; Milwaukee, Lake Shore and Western; Chicago and Grand Trunk; Great Western; Rome, Watertown and Ogdensburg; and Lake Shore and Michigan Southern.

Table of distribution.

Date of deposit.	Number of fish released.	Point of deposit.	Waters in which the fish were set free.
February 7	1,500,000	Saint Joseph, Mich	Lake Michigan.
8	1,500,000	Muskegon, Mich	Do.
13	2,000,000	Port Huron, Mich	Lake Huron.
16	1,750,000	Racine, Wis	Lake Michigan.
16	1,750,000	Sheboygan, Wis	Do.
21	3,500,000	Oswego, N. Y	Lake Ontario.
24	3,500,000	Islands of Lake Erie	Lake Erie.
28	1,000,000	Ludington, Mich	Lake Michigan.
March 2	1,250,000	Detroit, Mich	Detroit River.
Total	17,750,000		

TROUT-WORK.

When the trout-ponds in connection with this station were established the stock of breeding fish was comparatively small, and the ponds themselves were mere excavations irregularly outlined. At the beginning of the year under consideration the embankments were quite unsafe, having been burrowed and undermined by muskrats, while the pond-room was quite inadequate to properly accommodate the increased stock of fishes. The work of enlarging and otherwise improving them, and the construction of an additional pond and new raceways, was therefore begun in the latter part of August and carried forward to completion by the last of October, or barely in time to give the ripening spawners undisturbed possession of the new premises during their spawning season. Three new ponds were also built the following spring, as before noted, making 7 altogether, 6 of which are 83 by 20 feet, and the other 51 by 14, showing a total pond area of 10,674 square feet.

The ponds are planked all around, the planks being spiked to stakes driven in front. Between and around all the ponds, and of the same height as the planking, is a pier of earth 8 feet wide, and across this are laid pieces of 2 by 4 firmly spiked to the stakes to which the planks are nailed. Being thus secured it is quite impossible for the earth to cave in or the sides of the pond to bend in or out. The bottom plank is set in a bed of gravel and blue clay, and a heavy body of the same material, well champed in, backs the planking up to the top of the pier, so that the ponds are practically water-tight, while the efforts of musk-rats to invade them by burrowing underneath will be futile. Each pond is usually filled to within a foot of the top, the bottom sloping gradually from the head, where the water is 18 inches in depth, to the foot, where it is 4 to 5 feet. The overflow gates of the discharging flumes are easily raised by a lever attachment at the bottom, so that the water can be drawn off in a few moments. The gates are made in sections, one or more of which can be removed to give any desired depth of water.

As quite a number of fish will spawn in the ponds instead of running up the raceways, if the former have gravel bottoms, which they should have, those in which the breeders are placed during the spawning season are divided into two sections by a temporary partition, and the bottom of the upper section covered with boards. The fish all being placed in this, but few, if any, eggs will be lost, and as fast as the fish are handled from the raceways they are transferred to the lower section. At the close of the spawning season the partition is removed.

At the mouth of the flume connecting the upper section with the raceway a trap-gate, sprung with a string leading to the hatchery, is fitted, a simple but very useful device, for no matter how stealthily one approaches, nor from what direction, some of the fish in the raceway will detect the movement and dart back to the pond before the gate can be dropped to head them off.

The fish are given access to the raceways at all seasons of the year, and hither they resort largely at other than spawning time. A raceway fed directly from a copious spring of cold water, and given sufficient fall to create a sparkling current over its clean, gravelly bottom, affords an attractive "summer resort" to trout having admission to it, and here, in warm weather, many of them congregate, lying nearly motionless, with head up stream, for hours together. At the approach of cold weather, when an equally satisfactory temperature is found in the ponds, this practice is discontinued, except with the ripening females, which, with a heavy body-guard of males, and in response to that instinct which impels them to deposit their eggs in a current, begin to prepare spawning beds in the raceway, whence they are easily captured at the proper time for the purpose of expressing their eggs.

The breeding fish are quartered in ponds nearest the feeding springs for some time preceding the spawning season, and, when most convenient, continuously. This gives them the least variance of temperature

obtainable, and ripens them at about the same time each season, there being but little fluctuation of temperature in these ponds at corresponding periods of one year with another.

The spawning season therefore opens almost invariably from the 1st to the 5th of November, and closes practically from the 10th to the 15th of January, although much the greater portion of the fish spawn from the middle of November to the middle of December. During the past season, perhaps a half-dozen spawned later than the latest date mentioned, and from one of these eggs were not taken until February 2.

Some 140,000 were taken altogether. The first 120,000 turned out very well, a loss not to exceed 10 per cent. occurring during incubation; but the last 20,000 showed a loss of 50 per cent., due to the plan of handling the fish from which they were taken. A majority having spawned, we placed the remaining fish in the raceway, and carefully examined them every morning. As a result of this repeated dipping up and inspection of the fish for several mornings in succession, we were compelled to pick away quite half of the eggs so taken—which is pretty good evidence that the less the fish are disturbed or manipulated while ripening, the better the eggs produced.

The following statement accounts for the disposition of the eggs and fry:

Total number eggs taken		140,000
Loss during incubation	22,000	
January 10, shipped to F. Mather, for reshipment to France	20,000	
January 24, shipped to Druid Hill hatchery, Baltimore, Md	30,000	
		72,000
Number fry hatched		68,000
March 8, planted in Washtenaw County, Michigan, in spring brook tributary to river Rouge		10,000
March 15, planted in spring brook near the Northville hatchery, and tributary to river Rouge		10,000
May 8, shipped per United States Fish Commission car, in charge of J. F. Ellis		30,000
Loss on fry since hatching		8,000
Fry now on hand in nursery tanks		10,000
		68,000

Average period of incubation, 84 days.

As our breeding force of brook trout will receive large accessions next fall from the stock of growing fishes, we confidently expect to take at least a half million eggs during the next spawning season.

HATCHING AND DISTRIBUTION OF CALIFORNIA TROUT.

On January 24, Mr. Myron Green, of the United States station at Baird, Cal., consigned to the Northville hatchery a case containing 45,000 eggs of the rainbow trout, and on February 6 a second lot of 30,000. The first shipment reached Northville February 2, and the last February 14, both in excellent condition. Number of dead eggs picked from first lot on arrival, 615; from the last, 272; subsequent loss on eggs, about 2,600. The fish began hatching February 24, and all were out by the middle of March.

Shortly after these fish hatched an accident occurred by which 18,000 of them perished. On the night of March 21 a flooding rain-storm washed into the feeding reservoir, and thence into the tanks supplying the hatching boxes, a sufficient quantity of moss, leaves, and *débris* generally to almost wholly clog the screens, diverting to the overflow or waste channel the water that should have passed through the trays on which the fish were still retained. The oldest fry fared much worse than those more recently hatched, and especially those in boxes at the foot of the row, the limited amount of fresh water still running having become de-oxygenated before reaching them. In the head boxes, and also in an adjoining row of boxes containing fry of brook trout (of about same age, but much smaller), the loss was merely nominal. In a third row containing the Schoodic salmon, just hatched, there was no loss whatever.

I had felt that everything was secure and free from danger of accidents—that every precaution for the safety of the fish had been observed; but since meeting with so serious a loss from a source wholly unanticipated, I can but feel that the only safeguard against accidents or insecurity lies in never leaving the fish alone, and shall, therefore, in the future, employ a nightwatch so long as fish in any considerable numbers remain in the hatchery.

Appended is a statement of distribution, &c.:

Number eggs received from California		75,000
Loss on eggs during incubation		3,500
Number fish hatched		71,500
Loss by accident, as noted	18,000	
Loss of fry to date (June 30) in nursery tanks	3,500	
Fry on hand in nursery tanks	10,000	
April 28—Deposited at Beitner Station, Grand Traverse County, Michigan, in Boardman River, tributary to Grand Traverse Bay	3,000	
May 2—Delivered to A. C. Lanier, of Madison, Ind	3,000	
May 7—Deposited by George N. Matheson, of Sarnia, Ontario, in small stream in Western Ontario, tributary to Lake Saint Clair	3,000	

May 16—Deposited by James R. Bull, of Saint Louis, Mo., in Island Lake, Monroe County, Illinois	3,000	
May 29—Deposited in Oakland County, Michigan, in Deer Lake, through which flows the Clinton River, tributary to Lake Saint Clair	10,000	
June 1—Deposited in Oakland County, Michigan, in Straits Lake, through which flows the Huron River, tributary to Detroit River	10,000	
June 3—Deposited in Wayne County, Michigan, in northeastern branch of river Rouge	8,000	
		71,500

From eight adult California trout, five of which are females, all brought from California four years ago and since confined in the ponds here, we took 5,150 eggs between the 13th and the 29th of March, which hatched on an average in 38 days. The loss on eggs was 850; and on April 26, 1,200 eggs were shipped to F. Mather for reshipment to Herr von Behr, Germany. The 3,100 fish that hatched were deposited May 16, by James R. Bull, of Saint Louis, Mo., in Murdoch Lake, Monroe County, Illinois.

Next spring we expect to take at least 100,000 eggs from the stock of California trout now on hand, that will then make their début as spawners. About half of these fish are the progeny of the eight adult fish above mentioned. They were two years old last spring, an age at which a majority of our brook trout have always spawned, although a portion of them, perhaps one-fifth, do not until three years old. We had therefore anticipated getting a nice supply of eggs from them, but failed to find a single mature spawner. Several females were opened at various times through the winter, with the result of finding only minute ova to mature a year later; still, we felt confident that a few of them at least would spawn, thinking we had missed the right ones; all the more so, too, from the fact that ripe males were numerous even three or four months in advance of the regular spawning season; in fact, the eggs taken from the adult California trout were mostly impregnated with milt from the two-year-olds. Failure to obtain a single egg from these fish, of which there are at least four or five hundred females, leaves little room to doubt the conclusion that the *iridea* seldom, if ever, spawn when two years old, at least where they are confined in ponds from infancy.

HATCHING AND DISTRIBUTION OF EGGS OF SCHOODIC SALMON.

On the 28th of February, Mr. Charles G. Atkins shipped from Grand Lake Stream, Maine, for the Northville hatchery, a case of 46,500 eggs of Schoodic or land-locked salmon. They arrived March 4, and opened up in excellent condition, only 45 dead eggs being observed on unpacking. Previous to hatching, 1,065 more were picked away, showing a total loss of 1,110 eggs after arrival.

The fish began to come out March 16, rather slowly for two or three days, the water being down to 43½° on an average; but on the 19th the water ran up to 54° at noon, and the fish then came out with a rush, scarcely an egg remaining the day following. Quite a number of monstrosities and imperfect fish were observed, outside of which, however, they looked unexceptionally fine. They were also exceedingly active and strong in view of the great disproportion between their large, kidney-shaped sacs and light, slender bodies.

Soon after they began hatching, the novel spectacle of occasionally seeing the body of a fish on one side of the tray, with its sac underneath, was presented—due to the wonderful mobility of the sac, which sometimes permitted the downward current to draw it through the mesh of the tray, although four or five times larger than the aperture through which it had passed; after passing through it would soon assume its natural shape, protruding like an immense hernia, from which position the fish would be quite unable to extricate themselves. By inverting the tray and agitating in water, the soft, ductile pouch would soon pass back, releasing the fish unharmed. To overcome this difficulty, which at one time threatened to become quite annoying, the hatching boxes were reversed, so that the water passed upward through the trays instead of down, as before.

Below is the statement of distribution:

Number of salmon hatched		45,390
Imperfect and dead fish picked from hatching boxes and nursery tanks	4,540	
Fish now on hand in nursery tanks	2,850	
April 27—Deposited in Long Lake, Mecosta County, Michigan	6,000	
April 28—Deposited in Higgins Lake, Roscommon County, Michigan	3,000	
April 27—Deposited in Chippewa Lake, Lake County, Michigan	6,000	
May 1—Deposited by N. A. Osgood in Goguac Lake, near Battle Creek, Michigan, (fish shipped by express)	3,000	
May 3—Deposited at Piqua, Ohio, in water-works reservoir, containing 150 acres	6,000	
May 10—Deposited in Union Lake, township of Pontiac, Oakland County, Michigan	8,000	
May 15—Shipped per express from Toledo, Ohio, to S. E. Williams, La Porte, Ind	3,000	
May 15—Shipped per express from B. & O. junction with the Wabash, to T. B. Wightman, Cedar Beach, Ind	3,000	
		45,390

The fish were all planted in excellent condition, with the exception of the last two lots. Mr. Wightman reported that the fish sent him were

all dead on arrival, and Mr. Williams that nearly all were dead when received, the remainder being deposited in a lake near La Porte.

After successfully shipping 3,000 by express to Battle Creek, using in transit three to four hours, I was not a little surprised at the non-success of the other shipments; all the more so from the fact that those to Battle Creek were sent in one 10-gallon can without the loss of a single fish, whereas with each of the other lots two 10-gallon cans were used, which would more than offset the difference in time occupied in transit to their respective destinations. In all three consignments the water was reduced to icy coldness before starting.

The results attending these shipments, which were, to a certain extent, in the nature of an experiment, justify the conclusion that with the transportation of live fish success in one instance fails to establish a basis for calculations in other instances, where even the conditions and circumstances are, to all intents and purposes, alike; and that the chances of failure are reduced to the minimum only when the fish are under the constant surveillance of an experienced messenger.

DISTRIBUTION OF EGGS OF LAKE TROUT. (*Cristivomer namaycush.*)

When Mr. Wires started for Alpena in the latter part of October to look after the collection of whitefish eggs at that point, instructions were given him to obtain, if possible, a few eggs of lake trout if he arrived too early for the whitefish work. As the few whitefish then being captured in the inshore fisheries showed little indications of spawning, Mr. Wires, on the last day of October, put out about forty miles to the gill-net fisheries, where he found the lake trout nearly all spent, but succeeded in getting 57,000 eggs. These were shipped by boat to Bay City, whence they were met by special messenger and delivered to the Northville hatchery, November 2.

The loss of eggs while in the hatchery was 3,600; December 10, 20,000 were consigned to Mr. F. Mather for reshipment to Herr von Behr, Germany; and on January 3, 30,000 were forwarded to Commissioner Shaw of Iowa, who reported that they arrived in prime condition January 6 and commenced hatching the day following, the total loss on eggs and fish being less than 5 per cent. The eggs were now well along in advancement; in fact a few hatched the same day that the Iowa shipment was made; nevertheless a package of 2,000 was shipped to Newark January 7 to be transmitted by Mr. Mather to France, if their condition when received by him would warrant it; but despite their being reduced to a temperature of 31° before leaving the hatchery, a few hatched on their way to Newark, and Mr. Mather, therefore, hatched the remainder, the fry being subsequently released in Culver's Lake, Sussex County, New Jersey.

The stock of embryos and alevins was now reduced to 1,400; and these, after the hatching and sac-consuming process was completed, were

placed in one of the largest nursery tanks, where they still remain. Less than two dozen have died since hatching; they now average 3 inches in length, and are doing remarkably well, having learned to devour the liver and kidney "hash" given them as greedily as the brook trout in the ponds.

SUMMARY OF THE WORK AND ITS COST.

Number of eggs of whitefish shipped	2,032,000
Number of fry of whitefish planted	17,750,000
Number of eggs of brook trout shipped	50,000
Number of fry of brook trout planted	58,000
Number of fry of brook trout on hand	10,000
Number of eggs of California trout shipped	1,200
Number of fry of California trout planted	43,100
Number of fry of California trout on hand	10,000
Number of fry of Schoodic salmon planted	32,000
Number of fry of Schoodic salmon on hand	2,850
Number of eggs of lake trout shipped	52,000
Number of fry of lake trout on hand	1,400
Number of carp shipped	1,500
Approximate cost of the work, including the construction of seven new trout-ponds with their raceways, twelve new nursery tanks, and the cost of fish food for the year	$5,000

Temperature of Lake Erie from March 20 to June 1, 1882, taken daily at 12 m., near North Bass Island, by Chas. Hasford.

Date.	Temperature.	Date.	Temperature.	Date.	Temperature.	Date.	Temperature.
	°F.		°F.		°F.		°F.
March 20	38	April 8	45	April 26	46	May 14	49
21	37	9	44	27	48	15	48
22	36	10	42	28	49	16	49
23	38	11	41	29	49	17	51
24	37	12	42	30	49	18	53
25	37	13	42	May 1	49	19	54
26	38	14	42	2	48	20	54
27	40	15	43	3	50	21	54
28	39	16	44	4	50	22	54
29	41	17	47	5	49	23	53
30	40	18	49	6	48	24	54
31	39	19	47	7	48	25	55
April 1	40	20	46	8	49	26	56
2	42	21	47	9	49	27	56
3	42	22	46	10	50	28	55
4	44	23	46	11	49	29	56
5	43	24	46	12	49	30	58
6	44	25	47	13	49	31	58
7	45						

Record of temperature observations made at Northville, Mich., from November 15, 1881, to April 15, 1882.

DATE.			TEMPERATURE AT—						WIND AT—						CONDITION OF—		
			8 a. m.		1 p. m.		5 p. m.		8 a. m.		1 p. m.		5 p. m.		Sky.		
Day of week.	Day of month.		Air.	Water.	Air.	Water.	Air.	Water.	Direction.	Intensity.	Direction.	Intensity.	Direction.	Intensity.	8 a. m.	1 p. m.	5 p. m.
Tuesday	Nov.	15	27	38	36	40	32	42	West.	Brisk.	West.	Light.	West.	Light.	Cloudy.	Cloudy.	Clear.
Wednesday		16	34	42	46	43	42	45	East.	Light.	South.	Light.	South.	Light.	Cloudy.	Clear.	Cloudy.
Thursday		17	48	44	54	46	51	48	South.	Light.	SW.	Brisk.	SW.	Brisk.	Cloudy.	Cloudy.	Cloudy.
Friday		18	38	48	40	46	40	46	North.	Light.	East.	Mild.	East.	Light.	Cloudy.	Cloudy.	Snowing.
Saturday		19	32	41	34	42	30	42	West.	Light.	West.	Light.	West.	High.	Cloudy.	Cloudy.	Cloudy.
Sunday		20	24	37	28	39	26	42	West.	Light.	West.	Light.	West.	Light.	Cloudy.	Clear.	Clear.
Monday		21	33	39	39	41	36	42	SW.	Light.	SW.	Brisk.	SW.	Light.	Cloudy.	Cloudy.	Cloudy.
Tuesday		22	22	39	36	41	26	41	East.	Light.	SE.	Calm.	NW.	Calm.	Cloudy.	Cloudy.	Clear.
Wednesday		23	27	39	40	42	30	43	SW.	Light.	SW.	Light.	West.	Light.	Cloudy.	Clear.	Cloudy.
Thursday		24	20	35	24	36	25	36	West.	Light.	SW.	Brisk.	West.	Brisk.	Cloudy.	Cloudy.	Cloudy.
Friday		25	18	33	28	35	26	35	SW.	Light.	South.	Brisk.	SE.	Brisk.	Clear.	Cloudy.	Cloudy.
Saturday		26	34	37	36	39	35	40	SW.	Brisk.	West.	Brisk.	SW.	Brisk.	Cloudy.	Clear.	Cloudy.
Sunday		27	34	39	42	40	35	41	SW.	Brisk.	SW.	Light.	SW.	Light.	Cloudy.	Cloudy.	Cloudy.
Monday		28	31	40	41	43	36	44	SW.	Light.	South.	Light.	South.	Light.	Cloudy.	Clear.	Clear.
Tuesday		29	38	42	48	44	50	46	West.	Light.	SW.	Light.	SW.	Light.	Clear.	Clear.	Clear.
Wednesday		30	44	46	57	48	44	48	SW.	Light.	SW.	Light.	SW.	Light.	Cloudy.	Clear.	Cloudy.
Thursday	Dec.	1	36	46	37	48	36	45	SW.	Light.	West.	Brisk.	West.	Brisk.	Cloudy.	Cloudy.	Cloudy.
Friday		2	32	43	38	41	36	44	SW.	Fresh.	South.	Light.	South.	Light.	Cloudy.	Cloudy.	Cloudy.
Saturday		3	35	43	42	44	38	45	NW.	Light.	West.	Light.	SW.	Light.	Cloudy.	Cloudy.	Cloudy.
Sunday		4	34	43	40	43	39	46	SW.	Light.	SW.	Light.	SW.	Light.	Cloudy.	Cloudy.	Cloudy.
Monday		5	32	43	39	43	32	42	West.	Light.	NW.	Light.	SW.	Light.	Cloudy.	Cloudy.	Cloudy.
Tuesday		6	36	41	40	42	42	43	SW.	Light.	South.	Light.	SE.	Light.	Cloudy.	Cloudy.	Cloudy.
Wednesday		7	32	40	32	41	28	40	West.	Strong.	West.	Strong.	West.	Light.	Clear.	Clear.	Clear.
Thursday		8	26	39	36	39	32	39	SE.	Light.	SW.	Light.	SE.	Light.	Cloudy.	Cloudy.	Cloudy.
Friday		9	29	39	32	40	29	40	West.	Light.	West.	Light.	West.	Light.	Clear.	Clear.	Clear.
Saturday		10	10	36	29	38	26	39	West.	Light.	West.	Light.	NW.	Light.	Clear.	Clear.	Clear.
Sunday		11	24	37	32	38	31	38	SW.	Light.	SE.	Light.	SE.	Light.	Cloudy.	Cloudy.	Cloudy.
Monday		12	36	41	42	41	43	42	South.	Light.	SW.	Light.	SE.	Light.	Cloudy.	Cloudy.	Cloudy.
Tuesday		13	50	45	56	47	53	48	South.	Light.	SW.	Fresh.	SW.	Fresh.	Cloudy.	Cloudy.	Cloudy.
Wednesday		14	36	44	32	44	28	43	NW.	Fresh.	NW.	Fresh.	West.	Light.	Cloudy.	Cloudy.	Clear.
Thursday		15	18	39	28	40	24	41	West.	Light.	SW.	Light.	West.	Light.	Clear.	Clear.	Clear.
Friday		16	24	38	40	39	37	41	West.	Light.	South.	Light.	South.	Fresh.	Clear.	Cloudy.	Cloudy.
Saturday		17	30	39	48	41	40	43	South.	Light.	South.	Light.	South.	Light.	Clear.	Clear.	Cloudy.

Record of temperature observations made at Northville, Mich., &c.—Continued.

DATE.			TEMPERATURE AT—						WIND AT—						CONDITION OF—		
			8 a. m.		1 p. m.		5 p. m.		8 a. m.		1 p. m.		5 p. m.		Sky.		
Day of week.	Day of month.		Air.	Water.	Air.	Water.	Air.	Water.	Direction.	Intensity.	Direction.	Intensity.	Direction.	Intensity.	8 a. m.	1 p. m.	5 p. m.
Sunday	Dec.	18	32	41	44	42	32	44	SW.	Light.	NW.	Light.	NW.	Light.	Clear.	Clear.	Clear.
Monday		19	28	41	46	43	40	45	West.	Light.	SW.	Light.	South.	Light.	Clear.	Clear.	Cloudy.
Tuesday		20	38	44	44	45	40	44	SE.	Light.	NW.	Light.	NE.	Light.	Cloudy.	Cloudy.	Cloudy.
Wednesday		21	36	44	40	43	41	46	NE.	Light.	East.	Fresh.	East.	Fresh.	Cloudy.	Cloudy.	Cloudy.
Thursday		22	42	47	46	48	40	48	NW.	Light.	NW.	Light.	NW.	Fresh.	Cloudy.	Cloudy.	Cloudy.
Friday		23	28	40	32	41	28	40	North.	Strong.	North.	Strong.	NW.	Light.	Clear.	Clear.	Clear.
Saturday		24	20	39	32	40	32	42	South.	Light.	South.	Light.	SW.	Light.	Clear.	Clear.	Clear.
Sunday		25	28	40	40	41	36	44	West.	Light.	SW.	Light.	SW.	Light.	Clear.	Cloudy.	Cloudy.
Monday		26	38	44	44	45	40	48	SW.	Light.	SW.	Light.	NW.	Light.	Cloudy.	Cloudy.	Cloudy.
Tuesday		27	32	42	44	43	40	44	NE.	Light.	NE.	Light.	NW.	Calm.	Clear.	Cloudy.	Cloudy.
Wednesday		28	42	45	48	46	46	48	SW.	Light.	SW.	Light.	SW.	Calm.	Cloudy.	Cloudy.	Cloudy.
Thursday		29	32	44	42	46	38	46	SW.	Calm.	SW.	Light.	West.	Calm.	Clear.	Clear.	Clear.
Friday		30	22	41	26	42	22	39	SW.	Calm.	SW.	Light.	SW.	Fresh.	Clear.	Cloudy.	Cloudy.
Saturday		31	21	37	26	38	22	38	SW.	Fresh.	West.	Light.	West.	Fresh.	Cloudy.	Cloudy.	Cloudy.
Sunday	Jan.	1	16	36	20	36	19	36	NW.	Fresh.	West.	Light.	SW.	Light.	Cloudy.	Cloudy.	Cloudy.
Monday		2	5	36	22	38	26	38	SW.	Light.	SW.	Light.	SW.	Light.	Clear.	Clear.	Cloudy.
Tuesday		3	22	38	24	38	16	38	SW.	Fresh.	NE.	Fresh.	North.	Light.	Cloudy.	Cloudy.	Cloudy.
Wednesday		4	16	36	20	37	17	36	NE.	Light.	East.	Fresh.	East.	Light.	Cloudy.	Cloudy.	Cloudy.
Thursday		5	13	35	26	37	28	37	NE.	Light.	NE.	Light.	NE.	Light.	Cloudy.	Cloudy.	Cloudy.
Friday		6	28	38	30	38	33	40	North.	Light.	West.	Fresh.	West.	Fresh.	Cloudy.	Cloudy.	Cloudy.
Saturday		7	36	40	38	41	36	41	North.	Light.	East.	Light.	East.	Light.	Cloudy.	Cloudy.	Cloudy.
Sunday		8	44	43	52	46	41	41	West.	Calm.	SW.	Fresh.	SW.	Strong.	Cloudy.	Cloudy.	Cloudy.
Monday		9	29	41	32	40	32	41	West.	Fresh.	SW.	Fresh.	West.	Light.	Cloudy.	Cloudy.	Cloudy.
Tuesday		10	26	39	34	40	33	39	West.	Calm.	East.	Light.	East.	Fresh.	Cloudy.	Cloudy.	Cloudy.
Wednesday		11	30	39	40	41	36	41	SW.	Light.	SW.	Light.	SW.	Light.	Cloudy.	Cloudy.	Cloudy.
Thursday		12	10	38	42	40	30	40	SW.	Calm.	South.	Light.	SE.	Light.	Clear.	Cloudy.	Cloudy.
Friday		13	24	40	38	42	38	44	South.	Light.	SW.	Light.	SW.	Light.	Cloudy.	Cloudy.	Cloudy.
Saturday		14	20	38	22	38	22	38	SW.	Fresh.	SW.	Light.	SW.	Light.	Cloudy.	Clear.	Clear.
Sunday		15	28	38	40	39	36	42	SW.	Calm.	SW.	Light.	SW.	Light.	Cloudy.	Cloudy.	Cloudy.
Monday		16	28	40	26	39	20	39	West.	Calm.	West.	Light.	West.	Light.	Cloudy.	Cloudy.	Cloudy.
Tuesday		17	6	35	17	38	10	38	West.	Calm.	West.	Light.	West.	Calm.	Clear.	Clear.	Clear.
Wednesday		18	4	36	20	38	22	38	West.	Calm.	SW.	Light.	SW.	Light.	Cloudy.	Cloudy.	Cloudy.
Thursday		19	27	38	28	40	23	41	West.	Calm.	SW.	Calm.	SW.	Calm.	Clear.	Clear.	Clear.
Friday		20	24	38	34	40	33	41	West.	Calm.	SW.	Light.	SW.	Light.	Clear.	Clear.	Cloudy.
Saturday		21	34	31	37	44	34	44	SW.	Light.	SW.	Light.	SW.	Light.	Cloudy.	Cloudy.	Cloudy.

Sunday	22	15	35	16	35	10	34	SW.	Strong.	SW.	Strong.	SW.	Strong.	Cloudy.	Cloudy.	Cloudy.
Monday	23	5	34	16	36	12	37	West.	Light.	West.	Light.	NW.	Light.	Clear.	Clear.	Cloudy.
Tuesday	24	2	35	16	36	12	37	SW.	Calm.	South.	Fresh.	SW.	Light.	Clear.	Clear.	Cloudy.
Wednesday	25	22	36	34	37	34	39	South.	Calm.	South.	Light.	South.	Light.	Cloudy.	Cloudy.	Cloudy.
Thursday	26	36	41	44	42	42	44	South.	Calm.	South.	Calm.	SW.	Light.	Cloudy.	Cloudy.	Cloudy.
Friday	27	30	38	34	40	33	44	SW.	Light.	SW.	Light.	SE.	Light.	Clear.	Clear.	Clear.
Saturday	28	30	40	48	42	30	41	SW.	Calm.	SW.	Fresh.	West.	Strong.	Cloudy.	Cloudy.	Clear.
Sunday	29	11	32	20	35	18	36	NW.	Fresh.	NW.	Fresh.	SW.	Strong.	Clear.	Clear.	Clear.
Monday	30	13	34	30	37	28	38	SW.	Light.	SW.	Light.	SW.	Light.	Clear.	Clear.	Cloudy.
Tuesday	31	22	38	34	40	28	42	NW.	Light.	NW.	Calm.	NW.	Calm.	Cloudy.	Cloudy.	Cloudy.
Wednesday	Feb. 1	30	40	40	42	35	42	SW.	Light.	SW.	Fresh.	SW.	Fresh.	Cloudy.	Cloudy.	Cloudy.
Thursday	2	24	40	40	42	40	44	SW.	Light.	SW.	Light.	South.	Light.	Clear.	Clear.	Clear.
Friday	3	20	40	30	41	28	44	West.	Calm.	NE.	Light.	NE.	Calm.	Clear.	Clear.	Clear.
Saturday	4	26	40	38	44	36	43	West.	Calm.	West.	Light.	West.	Fresh.	Clear.	Clear.	Cloudy.
Sunday	5	20	40	40	43	38	44	SW.	Calm.	SW.	Light.	SW.	Fresh.	Cloudy.	Cloudy.	Cloudy.
Monday	6	28	42	37	44	36	44	SW.	Calm.	South.	Calm.	SE.	Light.	Clear.	Clear.	Cloudy.
Tuesday	7	38	42	48	44	46	44	NW.	Calm.	SW.	Fresh.	SW.	Fresh.	Cloudy.	Cloudy.	Cloudy.
Wednesday	8	29	40	36	44	32	46	SW.	Calm.	SW.	Light.	SW.	Calm.	Clear.	Clear.	Clear.
Thursday	9	20	41	40	43	36	46	West.	Calm.	West.	Calm.	West.	Calm.	Clear.	Clear.	Cloudy.
Friday	10	30	40	36	42	32	41	West.	Light.	West.	Light.	SW.	Light.	Clear.	Clear.	Cloudy.
Saturday	11	32	41	42	42	40	44	SW.	Calm.	SW.	Calm.	SW.	Calm.	Clear.	Cloudy.	Cloudy.
Sunday	12	44	46	54	48	52	49	SW.	Calm.	SW.	Fresh.	South.	Fresh.	Cloudy.	Cloudy.	Clear.
Monday	13	44	49	42	48	40	49	SW.	Fresh.	SW.	Strong.	SW.	Fresh.	Cloudy.	Clear.	Clear.
Tuesday	14	26	43	42	46	40	48	SW.	Calm.	SW.	Fresh,	SW.	Light.	Clear.	Clear.	Cloudy.
Wednesday	15	32	42	48	46	42	50	South.	Calm.	SW.	Fresh.	South.	Light.	Clear.	Clear.	Clear.
Thursday	16	34	45	46	46	50	48	SW.	Fresh.	SW.	Calm.	SW.	Calm.	Cloudy.	Cloudy.	Cloudy.
Friday	17	28	43	26	42	47	42	SW.	Calm.	NW.	Fresh.	North.	Fresh.	Cloudy.	Cloudy.	Cloudy.
Saturday	18	22	38	32	40	22	42	NE.	Calm.	NE.	Fresh.	NE.	Fresh.	Clear.	Clear.	Clear.
Sunday	19	36	42	46	44	30	44	NW.	Calm.	West.	Light.	West.	Light.	Cloudy.	Cloudy.	Cloudy.
Monday	20	30	42	36	42	40	42	North.	Fresh.	NE.	Light.	NE.	Fresh.	Cloudy.	Cloudy.	Cloudy.
Tuesday	21	32	41	36	39	30	38	SW.	Fresh.	SW.	Strong.	SW.	Strong.	Cloudy.	Cloudy.	Cloudy.
Wednesday	22	20	35	22	38	26	37	SW.	Fresh.	SW.	Strong.	SW.	Strong.	Clear.	Cloudy.	Cloudy.
Thursday	23	14	36	30	39	16	40	SW.	Light.	West.	Light.	SW.	Light.	Clear.	Cloudy.	Cloudy.
Friday	24	18	38	29	41	22	45	NW.	Light.	NW.	Light.	NE.	Light.	Clear.	Clear.	Clear.
Saturday	25	14	39	30	40	20	39	NW.	Light.	NW.	Light.	NW.	Light.	Clear.	Clear.	Clear.
Sunday	26	30	42	42	45	28	44	SW.	Light.	SW.	Light.	SW.	Light.	Clear.	Cloudy.	Clear.
Monday	27	38	45	48	46	43	46	SW.	Light.	SW.	Light.	SW.	Light.	Clear.	Clear.	Clear.
Tuesday	28	43	46	44	46	42	47	South.	Light.	SW.	Light.	SE.	Light.	Cloudy.	Cloudy.	Cloudy.
Wednesday	Mar. 1	48	48	55	52	46	50	South.	Light.	South.	Light.	South.	Light.	Clear.	Clear.	Clear.
Thursday	2	46	48	62	55	44	53	South.	Light.	South.	Light.	South.	Light.	Clear.	Clear.	Clear.
Friday	3	44	48	48	52	47	51	West.	Fresh.	West.	Fresh.	West.	Light.	Clear.	Clear.	Cloudy.
Saturday	4	33	45	46	47	44	47	NE.	Fresh.	East.	Fresh.	East.	Light.	Cloudy.	Cloudy.	Cloudy.
Sunday	5	48	48	58	54	52	57	SE.	Light.	SE.	Light.	South.	Light.	Cloudy.	Clear.	Clear.
Monday	6	36	45	52	50	50	49	SW.	Light.	SE.	Light.	SE.	Light.	Cloudy.	Clear.	Clear.
Tuesday	7	38	46	56	53	51	49½	SE.	Fresh.	SE.	Fresh.	SE.	Fresh.	Cloudy.	Cloudy.	Cloudy.
Wednesday	8	41	46	58	54	50	49	SE.	Fresh.	SE.	Fresh.	SE.	Fresh.	Cloudy.	Cloudy.	Cloudy.
Thursday	9	34	42	38	43	36	44	NE.	Light.	NE.	Light.	NE.	Fresh.	Cloudy.	Cloudy.	Cloudy.
Friday	10	30	42	34	42	31	42	NW.	Light.	NW.	Fresh.	NW.	Fresh.	Cloudy.	Cloudy.	Cloudy.
Saturday	11	30	42	36	44	31	45	West.	Fresh.	NW.	Fresh.	NW.	Fresh.	Cloudy.	Cloudy.	Cloudy.
Sunday	12	33	44	36	46	31	45	NE.	Light.	NE.	Light.	NE.	Light.	Cloudy.	Clear.	Cloudy.
Monday	13	28	42	32	45	30	45	NE.	Fresh.	NE.	Fresh.	NE.	Light.	Clear.	Clear.	Cloudy.
Tuesday	14	28	42	38	45	40	48	West.	Light.	NW.	Light.	NW.	Light.	Clear.	Clear.	Cloudy.

Report of temperature observations made at Northville, Mich., &c.—Continued.

DATE.			TEMPERATURE AT—						WIND AT—						CONDITION OF—		
			8 a. m.		1 p. m.		5 p. m.		8 a. m.		1 p. m.		5 p. m.		Sky.		
Day of week.	Day of month.		Air.	Water.	Air.	Water.	Air.	Water.	Direction.	Intensity.	Direction.	Intensity.	Direction.	Intensity.	8 a. m.	1 p. m.	5 p. m.
Wednesday	Mar.	15	30	41	34	44	32	43	SE.	Light.	SE.	Light.	SE.	Light.	Cloudy.	Cloudy.	Cloudy.
Thursday		16	33	42	40	44	34	46	South.	Light.	South.	Light.	South.	Light.	Cloudy.	Cloudy.	Clear.
Friday		17	28	40	44	45	30	41	East.	Light.	East.	Light.	East.	Fresh.	Clear.	Cloudy.	Cloudy.
Saturday		18	36	43	44	45	46	46	East.	Light.	SE.	Light.	SE.	Light.	Cloudy.	Cloudy.	Cloudy.
Sunday		19	34	43	52	54	50	52	NW.	Light.	NW.	Light.	NW.	Light.	Clear.	Clear.	Cloudy.
Monday		20	40	47	48	49	40	48	NE.	Light.	NE.	Light.	NE.	Fresh.	Cloudy.	Cloudy.	Cloudy.
Tuesday		21	34	44	32	44	26	43	West.	Light.	West.	High.	West.	High.	Cloudy.	Cloudy.	Cloudy.
Wednesday		22	24	41	30	42	30	42	NW.	Fresh.	NW.	Fresh.	NW.	Fresh.	Cloudy.	Cloudy.	Cloudy.
Thursday		23	30	41	44	47	48	48	SE.	Light.	SE.	Fresh.	West.	Light.	Clear.	Clear.	Cloudy.
Friday		24	21	40	30	44	26	44	NW.	Light.	NW.	Fresh.	NW.	Light.	Clear.	Clear.	Clear.
Saturday		25	26	41	35	43	30	42	NW.	Light.	SE.	Fresh.	SE.	Light.	Clear.	Cloudy.	Cloudy.
Sunday		26	38	44	54	50	58	52	SE.	Light.	SE.	Fresh.	SE.	Light.	Cloudy.	Cloudy.	Cloudy.
Monday		27	38	50	48	50	36	48	SW.	Light.	West.	Fresh.	West.	Fresh.	Cloudy.	Cloudy.	Cloudy.
Tuesday		28	26	42	49	50	47	49	NE.	Light.	NE.	Light.	NE.	Light.	Clear.	Clear.	Clear.
Wednesday		29	36	42	56	44	58	51	SE.	Light.	SE.	Light.	SE.	Light.	Clear.	Clear.	Clear.
Thursday		30	35	42	42	48	40	47	SW.	Fresh.	SW.	Fresh.	West.	Light.	Clear.	Clear.	Clear.
Friday		31	34	42	44	46	38	46	SW.	Fresh.	SW.	Fresh.	SW.	Light.	Cloudy.	Cloudy.	Cloudy.
Saturday	Apr.	1	40	45	62	54	68	56	SW.	Light.	SW.	Light.	SW.	Light.	Clear.	Clear.	Clear.
Sunday		2	60	50	70	56	62	55	SW.	Light.	SW.	Light.	NE.	Light.	Clear.	Clear.	Clear.
Monday		3	38	48	68	56	64	54	SE.	Light.	South.	Light.	South.	Light.	Clear.	Clear.	Clear.
Tuesday		4	50	50	66	55	60	53	South.	Light.	SW.	Fresh.	SW.	Fresh.	Cloudy.	Cloudy.	Cloudy.
Wednesday		5	48	50	67	56	58	54	West.	Fresh.	West.	Fresh.	West.	Fresh.	Clear.	Cloudy.	Cloudy.
Thursday		6	52	51	58	53	50	51	NW.	Fresh.	NW.	Fresh.	NW.	Fresh.	Clear.	Clear	Clear.
Friday		7	51	49	57	51	56	50	West.	Fresh.	West.	Fresh.	West.	Fresh.	Clear.	Clear	Clear.
Saturday		8	42	48	52	50	50	50	NE.	Light.	NE.	Light.	NE.	Light.	Cloudy.	Cloudy.	Cloudy.
Sunday		9	51	49	44	48	44	48	East.	Fresh.	East.	Light.	East.	Light.	Cloudy.	Cloudy.	Cloudy.
Monday		10	42	48	30	42	24	41	East.	Fresh.	East.	Fresh.	East.	Light.	Cloudy.	Cloudy.	Cloudy.
Tuesday		11	40	47	28	41	29	42	NW.	Light.	NW.	Fresh.	NW.	Fresh.	Clear.	Cloudy.	Clear.
Wednesday		12	26	41	40	44	38	44	NW.	Light.	North.	Fresh.	North.	Light.	Cloudy.	Clear.	Clear.
Thursday		13	22	40	42	45	46	47	NW.	Light.	North.	Light.	NE.	Light.	Cloudy.	Cloudy.	Cloudy.
Friday		14	30	40	40	44	45	45	NE.	Light.	NE.	Light.	NE.	Light.	Cloudy.	Cloudy.	Cloudy.
Saturday		15	36	44	48	50	45	49	North.	Light.	NE.	Light.	NE.	Light.	Clear.	Clear.	Cloudy.

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XXI.—THE REPORT OF OPERATIONS AT THE UNITED STATES SALMON-BREEDING STATION ON THE McCLOUD RIVER, CALIFORNIA, DURING THE SEASON OF 1881.

By Livingston Stone.

Hon. Spencer F. Baird:

Sir: I beg leave to report as follows: When my last report closed in October, 1880, 2,000,000 salmon eggs had been left in the McCloud River hatching-house to be hatched by the State of California for the Sacramento River and its tributaries. These were successfully hatched and placed in the McCloud River before Christmas, when all work at this station was discontinued for the season.

Up to this time the rainfall had not been unusually large. Indeed, there had been more than the customary number of fair days until the 18th of December, when it began to rain and continued to rain eleven days in succession, the river rising on the 25th 8 feet and 2 inches above its summer level. This was nothing extraordinary, however, and no fears or even misgivings were entertained of any disaster from flood to the fishery buildings, they being built from 18 to 19 feet above the river. There was a dense fog over the McCloud River the last two days of December, but no rain, and when the new year opened the river had fallen back to within a foot and a half of its usual level.

The month of January, however, was attended by a rainfall wholly unprecedented in Northern California since its settlement by white men.*

Forty-seven inches of water fell at Shasta during this month, and in the mountains where the fishery is situated the fall must have been much greater. On the 27th of January the McCloud had risen 12½ feet, but the water had been higher than that in previous years, and still no one supposed that the buildings were in danger. Again the river fell, but this time the fall was succeeded by the greatest rise of water ever known in this river before, either by white men or Indians now living. During the first days of February the rain poured down in torrents. It is said by those who saw it that it did not fall as rain usually falls, but it fell as if thousands of tons of water were dropped in a body from

* Rainfall at Shasta, January, 1881 ..... 47 inches.
Rainfall at Shasta, February, 1881 ..... 17.5 inches.
Total rainfall for season ..... 109.7 inches.

I hereby certify the above to be correct.

JAMES E. ISAACS,
Weather Observer, Shasta, Cal.

Shasta, Cal., *August* 1, 1881.

the sky at once. Mr. J. B. Campbell relates that near his house, in a cañon which is dry in summer, the water in not many minutes became 30 feet deep, and the violence of the current was so great that trees a hundred feet long were swept down, trunk, branches and all, into the river. On the 2d of February the McCloud River began to rise at the rate of a foot an hour. By 9 o'clock in the evening it was 16 feet and 8 inches above its ordinary level. This was within 4 inches of the danger-mark, and two young men who were at the fishery, Richard D. Hubbard and Oscar Fritze, made an attempt, at the risk of their lives, to save some of the most valuable movable property in the buildings. With great courage and determination they waded through the fierce current, in the blinding rain and pitchy darkness, and rescued many valuable things, but the water around the house was then up to their shoulders and the unequal struggle could not be long maintained. These young men are, however, entitled to great credit for succeeding in rescuing what they did from the flood on that frightful night.

The water was soon a foot above the danger-mark, and the buildings began to rock and totter as if nearly ready to fall. There was now no hope of saving them or anything in them. At half-past two in the morning of the 3d of February, they toppled over with a great crash and were siezed by the resistless current and hurried down the river.

When the day dawned nothing was to be seen of the main structures which composed the United States salmon-breeding station on the McCloud River. The mess-house, where the workmen had eaten and slept for nine successive seasons, and which contained the original cabin, 12 feet by 14 feet, where the pioneers of the United States Fish Commission on this coast lived during the first season of 1872; the hatching-house, which, with the tents that preceded it, had turned out 70,000,000 salmon eggs, the distribution of which had reached from New Zealand to St. Petersburg; the large dwelling-house, to which improvements and conveniences had been added each year for five years—these were all gone, every vestige of them, and nothing was to be seen in the direction where they stood except the wreck of the faithful wheel which through summer's sun and winter's rain had poured 100,000,000 gallons of water over the salmon eggs in the hatchery, and which now lay dismantled and ruined upon the flat-boats which had supported it, and which were kept from escaping by two wire cables made fast to the river bank. The river continued to rise the next forenoon until it reached a maximum height of 26 feet and 8 inches above its summer level. This, of course, is not a very extraordinary rise for a slow-moving river, but when it is remembered that the McCloud is at low water a succession of cascades and rapids, having an average fall of 40 feet to the mile, it will be seen at once what a vast volume of water must have been poured into this rapid river in a very short time, and with what velocity it must have come to have raised the river 26 feet when its natural fall was sweeping it out of the cañon so swiftly.

Those who saw this mighty volume of water at it highest point, rushing through its mountain cañon with such speed, say that it was appalling, while the roar of the torrent was so deafening that persons standing side by side on the bank could not hear each other when talking in an ordinary tone of voice.

It must be over two centuries since the McCloud River rose, if ever, as high as it did last winter. There is very good evidence of this on the very spot where the fishery was located, for just behind the mess-house, and exactly under where the fishery flag floats with a good south breeze, is an Indian grave-yard, where the venerable chiefs of the McCloud have been taken for burial for at least two hundred years, and there is no knowing how much longer. One-third of this grave yard was swept away by the high water last winter, and the ground below was strewn with dead men's bones.

Now, the fact that the Indians have been in the habit of burying their dead in this spot for two centuries proves that the river has never risen to the height of last winter's rise within that time, for nothing could induce Indians to bury their fathers where they thought there was the least danger of the sacred bones being disturbed by floods.

When the waters subsided, it became apparent what a clean sweep the river had made. Here and there the stumps of a few posts, broken off and worn down nearly to the ground by the driftwood rubbing over them, formed the only vestiges whatever to indicate that anything had ever existed there but the clean rocky bar that the falling water had left.

The inventory showed that over $4,000 worth of hatching apparatus, house furniture, tools, and other articles were lost or destroyed by the flood, besides the buildings themselves. The whole loss could not have been less than $15,000.*

At the time of the disaster all communication with the outside world was shut off by the high water in the rivers. On the 6th of February, Mr. Myron Green succeeded with great difficulty in taking a telegram from the trout ponds to Redding, a distance of 25 miles. Mr. Green was three days in accomplishing the journey, and in several instances swam the intervening creeks, carrying his clothes on his head. As soon as the news reached Professor Baird he telegraphed to Hon. B. B. Redding, of San Francisco, to telegraph Senator Booth, at Washington, to obtain an appropriation for rebuilding the fishery. It was now almost at the close of the Congressional session, but Senator Booth succeeded in securing an appropriation of $10,000, to be expended under the direction of Professor Baird in restoring the buildings and property destroyed by the flood. As soon as this appropriation was made Professor Baird gave me instructions to proceed at an early date to the McCloud River and enter at once upon the work of restoring the fishery.

* An account of the effects of the high water at the United States trout ponds, 4 miles farther up the McCloud River, will be found in the report of operations at that point.

In pursuance of these instructions I arrived at the fishery on the 19th of May, having previously arranged to have 30,000 feet of lumber delivered on the premises before my arrival. I immediately engaged workmen and ordered material, and on Monday morning, May 23, the work of rebuilding was under full headway, with a force of upwards of twenty white men and about a dozen Indians. There being no building of any magnitude left, we lived in tents until the mess-house was finished, one large tent, 60 feet by 30 feet, divided by a partition into two compartments, serving for a sleeping-room and dining-room for the workmen.

We encountered one serious difficulty at the very outset in putting up the new buildings. When we first built here it was supposed that the flat or nearly flat land lying 12 or 15 feet above the level of the river was safe from high water, and we accordingly erected our buildings there, protecting them from a possible rise of 3 or 4 feet more by a very ponderous breakwater. As the water last winter rose to the almost incredible height of 26 feet above the river's natural level, we were only left the alternative of putting the buildings on the hill-tops or on the hill-sides. The first being out of the question, of course we were driven by necessity to build on the hill-sides. This involved a great deal of grading, which in turn necessitated very laborious digging and excavating, sometimes even into the solid rock. It was a long, slow, and expensive work. It was a provoking paradox that here where land was as free as air and almost as boundless, it should cost, as it did in some instances, $1,000 an acre. It seemed at first as if we should never get through digging, but after the foundations were all laid the work went on rapidly, and progressed without any drawbacks, except a lack of means, until everything was done. The lack of means resulted from an attempt to accomplish with $10,000 what could not be done for less than $15,000, but it was work which could not be done by halves, and I concluded to go on and finish the work and trust to subsequent action of Congress for indemnification.

On the 1st of September we had on the fishery grounds a mess-house, hatching-house, and stable. We had also built a bridge 150 feet long across the river, and had added to it as usual a firmly built fence or rack that allowed the water to pass down but prevented the salmon from going up the river.

The mess-house is a well-built and nicely painted two-story house, 40 feet by 25 feet, containing a kitchen, pantry, store-room, dining-room, and men's room on the lower floor, with three large sleeping apartments on the second floor. It is well supplied with running water from a spring on the hill behind the house, so that there is always a full tank of fresh cold water in the kitchen, another tank on the second floor to be used in case of fire, and another on the porch where the men wash. This abundant supply of cold water in this very hot climate is a great convenience, not to say luxury. The mess-house rests on bed-rock, well up above high-water mark, and is perfectly safe from any future floods.

The stable is a well-built, substantial two-story building, 40 feet by 20 feet, with accommodations for four horses. It has two commodious store-rooms and a loft. On the north side, where it is protected from the sun in summer and the storms in winter, a shed is built joining the barn.

The hatching house is a large, handsome, painted building 80 feet long and 30 feet wide. It stands well above the danger mark of high water, and is provided with forty hatching troughs, each 16 feet long, furnished with seven hatching baskets, each 2 feet long, making two hundred hatching baskets in all. These baskets will carry 35,000 salmon eggs each, giving a total hatching capacity to the whole house in round numbers of 10,000,000 salmon eggs.

The hatching-house is provided with nine windows on each side, one window in each gable end, and five sky-lights on the roof, all of which combined furnish a good supply of light even on the dark, rainy days in the fall when the salmon are being hatched for the restocking of the tributaries of the Sacramento. On the east end of the house is a large shed built for the purpose of furnishing room and shelter while packing the eggs intended for distribution. The water supply for hatching the eggs is lifted to the house by a current-wheel in the river. This wheel is a fine piece of workmanship, and a credit to the builders. It is 32 feet in diameter, is furnished with thirty-two arms and thirty-two paddles, and revolves on a shaft 18 inches in diameter. It rests on two very substantially built boats, each 36 feet long and 8 feet wide. On these there rests, sustained on suitable supports, the current-wheel. The boats and wheel are placed at a point in the river where the current has the greatest velocity, which gives the wheel a lifting capacity of 24,000 gallons an hour.

In addition to the structures already mentioned, there was the post-office building, which was washed off its original foundation and somewhat injured by the high water, but which had been replaced, raised higher, and somewhat enlarged. This is now used as a dwelling-house. A small store-house which survived the flood, and the spawning-house for taking the eggs, complete the list of buildings at the McCloud River salmon fishery as it is now restored.

As may be supposed, some of the methods of work employed here are of a primitive character. To illustrate this, allow me to trace the boat gunwales through their various stages of progress till they were framed into the boats.

The boats' gunwales were to be 36 feet long and 29 inches wide. It was therefore necessary to find a tree which would furnish a stick of good timber 37 feet long and 30 inches wide; and we hoped at first to find a tree from which could be cut a rectangular joist 30 inches by 24 inches, and 37 feet in length. The work of getting out the gunwales began, therefore, with finding the tree. With this object in view, Mr. Campbell spent three or four days in the hills hunting for a suitable

tree, but could not find one within four miles of the fishery. He did find, however, a tree which would furnish a stick of timber of the required length and width and 12 inches in depth. This being the largest tree that could be discovered within a reasonable distance, it was cut down. Then four men spent three days scoring and hewing the log to get it reduced to the proper dimensions and shape to be sawed into two gunwales. When this was done a saw-pit was made and the timber was hoisted on the pit. Then two men spent nearly two days sawing it in two, lengthwise, with a whip-saw, one sawyer standing under the log and one above it. We now had in the rough two solid plank gunwales of the required length, width, and depth. As they lay on the saw-pit they weighed nearly a ton apiece, and were too heavy for even ten men to move any distance, so we forded the river with a pair of horses and drew the planks down the hill-side to the river. From here they were floated down the stream and across the river to the landing nearest the point where the boats were to be built. From here they were drawn by horses again to the "ship-yard," as we called it. Then after considerable hewing and finishing they were framed into the boats, making two very solid and satisfactory gunwales. After these were got in, the same process was repeated with another tree with the same results, from which we obtained two more gunwales for the other boat. I mention these details to show that we have something more to do here when we want a thing of this sort than to go to the lumber yard and order it.

In the four gunwale planks just described there were 1,600 feet of lumber. But this was not all the work of this kind that we had to do, for before the season was over we got out from the woods over 20,000 feet of square timber.

The hatching house and the wheel, and the flume for carrying the water from the wheel to the house, were no sooner completed than the salmon began to spawn. This was in the last week of August. The first ripe salmon, indeed, was caught August 25.

This reminds me that I must mention the work that had to be done on the seining ground, a large nearly circular basin in the river, where we draw the seine for capturing parent salmon. When we left off fishing last fall the ground over which we drew the seine was smooth and safe for seining. When we examined it this spring, after the floods, it was found to have been plowed through and through by the violence of the current. Such deep cuts had been made through the former bed of the river that both bowlders and sharp points of bed rock, before entirely covered, now projected 8 or 10 feet above the general level of the river bed, and made it wholly impossible, of course, to draw the seine over them. Our attempts to draw the seine before repairing the ground resulted in getting snagged the first few times and finally tearing the net entirely in two.

The restoring of the seining ground being absolutely necessary, we went to work at it as soon as the mess building was completed and the

workmen had a house to eat and sleep in. We began with carefully examining the ground by going over it with a boat, and by feeling of the bottom of the river with long poles. After finding out in this way where both the depressions and projections were, we went to work with giant powder and blasted for two or three days till we had broken up and leveled down to a great extent the projecting ledges and bowlders. We then took one of our large flat boats or scows and ran it out over the places to be filled up, and, bridging over the space between the boat and the shore, we set a force of a dozen Indians or so at work on a soft bank on the shore. The Indians with picks and shovels cut down the bank, and then with wheelbarrows carried the earth and gravel out to the scow and dumped them into the holes where the earth was needed in the seining ground. This work was carried on until all the depressions on the seining ground were filled up, and the tops of the broken rocks wholly covered over. After this was done a few hauls of the net smoothed the whole place over, and the seining ground was as good or better than before.

Before proceeding further with the taking of the salmon eggs, I ought to say that a strange and fatal disease made its appearance among the salmon of the river about the 25th of June. We first discovered it from observing dead salmon collecting in the eddies, and others floating down the river. Dead salmon during and after the spawning season are common enough in the river, but to see them in June was a very unusual sight. In fact it was a sight never seen before in our ten years' experience on the McCloud. The chief peculiarity of the disease was that many, if not most, of the dying fish presented a perfectly healthy exterior. They were clean, plump, silvery fish, free from fungus and parasites, and without a mark or sign on the surface to show that anything was wrong about them. I examined several to discover the cause of the mortality. In most of the fish that I dissected the mouth and gills seemed healthy and intact, while the viscera were very much congested with dark blood, and the spleen was very much enlarged. Later in the season, those that I examined all had unhealthy gills. The gills in these cases were very much abraded on the outer edges, and were almost stuck together by a slimy or gummy substance, as if the gills had been injured and had freely maturated. This was found to be the case with many living fish which were caught in the seine. Neither of the symptoms just described were ever observed here in the salmon before this year. I preserved in alcohol several specimens of the viscera of salmon dying from this disease, and sent them to the National Museum at Washington, where an examination of them will probably throw some light upon the causes of this mysterious epidemic.

Proceeding now with the taking of salmon eggs, I will go on to say that the number of ripe salmon caught at each haul in the seine soon commenced to increase, and on the 18th of August I thought it safe to begin to collect salmon eggs for the hatching house. On that day we

took 140,000 eggs, the parent salmon appearing to be very thick in the river. The next day we took 225,000, and by September 2 we had exceeded half a million a day. The next day we took more yet, and from this time till we stopped fishing we could have taken a million a day if necessary. Ripe salmon never were so abundant before in the fishing season. We caught frequently at one haul of the seine more than we used to catch, a few years ago, in twenty-four hours. The salmon were very large, too, the average weight of the spawned fish being several pounds more than last year, and the average number of eggs to the fish being 4,205 against about 3,000 in 1880 and a still smaller number in 1879. In consequence of the abundance of spawning fish, combined with their large size and average of eggs, the fishing season was made comparatively easy this year.

When salmon are scarce we have been in the habit of drawing the seine continuously night and day through the twenty-four hours. When they are plentiful the regular time for drawing the seine is from 4 a. m. to 10 a. m., and from 5 p. m. to 10 p. m. This year, on account of the extraordinary abundance of the fish, we frequently had to make but two or three hauls a day, and even at this rate we took all the eggs needed (7,500,000) before the spawning season was half over—a piece of good luck that never came within our experience before.

I may add here that this vast increase in the number of salmon in the river is the direct result of the artificial hatching of young salmon at this place. For several years past the United States Fish Commission has presented to the State of California 2,000,000 salmon eggs or more each year. These eggs the State fish commission has hatched each year at its own expense and has placed the young salmon in tributaries of the Sacramento. This artificial stocking of the river has resulted in a wonderful and wholly unprecedented increase of salmon in this river. So great has been the increas ethat the annual catch of salmon in the Sacramento River is worth nearly half a million dollars more than it was seven years ago, before the hatching operations were resorted to. This one result of the work done by the United States Fish Commission on the McCloud River would be ample compensation for all the outlay which has been made there, supposing that it were attended with no other results.

There was not much else done during the fishing season except to catch parent salmon and to collect eggs, as it takes nearly all hands to draw the seine and to take care of the eggs when taken. However, some work was done in adding conveniences to the hatching house and in preparing for shipping the eggs.

The last eggs for the regular season's supply were taken on the 8th of September, making a total of 7,500,000. The salmon in the river on the day we left off fishing seemed thicker than ever. If they had been needed I think we could have taken 20,000,000 eggs this season.

The time between the end of the season's spawning and the begin-

ning of the packing for shipment was devoted to the taking care of the eggs, to making crates and boxes to ship the eggs in, to picking over the moss to pack with, and to cleaning up generally for the season.

Everything went on smoothly till packing time, and without accident, with one exception. This exception, however, was one of the gravest character, and consisted of an accident to the wheel, which filled us all with consternation and alarm. It happened the 18th of September, on a remarkably quiet and pleasant Sunday morning. The white men employed at the fishery were scattered over the grounds, and there were three or four Indians about. No one had the slightest expectation of any disaster. Everything connected with the hatching of the eggs seemed to be going on with the utmost success and safety, when suddenly, in the direction of the current-wheel, which lifts the water for the hatching house, an ominous sound of a blow was heard, followed by a crash, like the breaking of a board—then another and another—and those who happened to be in sight of the wheel saw that it had begun to break up and was rapidly going to pieces. A moment before, hardly half a dozen men could be seen. A moment after, more than twenty men, white and red, were gathered on the bar opposite to where the wheel was stationed. It seemed at first as if the wheel would be torn to pieces in a moment. It was revolving at the rate of five revolutions a minute in a very rapid and powerful current. But the injury itself was the cause of its own cessation.

Though no one knows positively the cause of the accident, it is supposed that it was occasioned by driftwood coming down the river and catching somewhere about the wheel so as to obstruct it. The momentum of the current here being so great that it forced the wheel around, notwithstanding the obstruction, there could be but one result—the breaking up of the wheel. But, of course, after five or six paddles were broken off on one side of the wheel, there was a large space on the circumference of the wheel, where it did not reach the water at all; when this part of the wheel came around again to the surface of the water, there being no paddles to reach the current, the wheel stopped of its own accord.

As soon as the accident was discovered not a moment was lost in establishing a line of buckets from the river to the hatching house to supply water to the eggs. Every white man and Indian that could be pressed into the service was employed, and in less than ten minutes we had three lines, of eight or ten men each, bringing water from the river in buckets, tubs, watering-pots, and anything that could be found, that would hold water. This being accomplished, and the eggs released from immediate danger, I gave attention to the wheel. It appeared that seven paddles were broken off, with a portion of each arm attached. The question now was whether the men could hold out bringing water till the wheel could be repaired. I do not know what we could have done in this emergency without the Indians; but I do not think we

could have saved the eggs except by their aid. They worked splendidly, most of them from eleven o'clock in the morning, when the wheel broke down, until four o'clock the next morning, when it was started again—seventeen hours of continuous work, with two very short interruptions, when I allowed them, three at a time, to run to the house to get something to eat. During all this seventeen hours some of them were carrying buckets of water that weighed sixty or seventy pounds each. They did not work as if they were working merely for pay; but they worked with genuine enthusiasm. They kept in good spirits, too, till an hour or two after midnight. But about two or three o'clock in the morning it was evident that it was all they could do to keep at it. I do not think they could have held out much longer. I have seen white men look as tired as they did, but I never saw such a tired look on Indians' faces before as there was on the faces of those red heroes who saved our salmon eggs. When it is remembered that we consider 10,000 gallons of water an hour necessary to keep all the eggs in good condition, an idea may be formed of the labor that was involved in bringing the water to the eggs. I must not forget to say here that the white men worked as heroically as the Indians, though their work was not as exhausting, and I must especially mention Mr. J. B. Campbell, who took charge of repairing the wheel, and who worked with all his might from the time it broke till it was fully repaired. At four o'clock in the morning the wheel was again making its accustomed revolutions and raising the regular current of water to the hatching house. When this had been accomplished the rest of us, leaving one man to watch the wheel till breakfast time, retired to sleep the remainder of the night.

Before leaving the subject of the accident to the wheel, I will mention a contrivance which we adopted for furnishing water to the eggs, which, though very simple, saved an enormous amount of labor and is strongly recommended for any hatching house that may be unfortunate enough to have its water supply cut off for any length of time.

The device was as follows: A long, large, receiving tank was placed under the outlet of the hatching troughs so as to catch and hold the water that flowed from them. In addition to this, a line of raised spouts was erected from the outlet end of the hatching house to the filtering tank at the other end, sufficiently elevated to deliver into the filtering tank the water that was poured in at the other end. Several men then went to work at the outlet end of the house to dip the water up in buckets from the receiving tank and to pour it into the head of the elevated line of spouts. The water so dipped up flowed down the line of spouts into the filtering tank, and thence over the eggs again into the receiving tank.

In this way a constant circulation was kept up through the hatching troughs by the small stationary force of men dipping and pouring at the elevated spout. This, with the water that was also being brought from the river, formed an adequate supply, and the eggs were kept in

perfect condition all night, and, strangely enough, there was no perceptible loss of eggs during the whole time of the stoppage of the wheel, although there were 7,500,000 salmon eggs in the hatching house.

Everything went on smoothly and prosperously after the wheel was restored, the eggs matured with less loss than usual, and on the 24th of September they were ready to be packed for shipment. On that day we packed and crated 1,450,000 eggs. On the next day we packed and crated 1,700,000, and on the third day we packed and crated 450,000, making in all 36 crates, containing a total of 3,600,000 eggs. These were all taken to Redding in wagons and then loaded into a car as usual, nearly all the spare space in the car being filled with ice.

This car left with the passenger train for the East on Wednesday morning, September 28, and arrived at Chicago on Monday, October 3. From Chicago the eggs were distributed by the United States Express Company as follows:

Record of the distribution of salmon eggs from the United States salmon-breeding station on the McCloud River, California, during the season of 1881.

Applicants.	Destination.	Number of eggs.
T. B. Ferguson	Druid Hill, Baltimore, Md	500,000
R. O. Sweney	Saint Paul, Minn	200,000
R. R. Livingston	Omaha, Nebr	500,000
A. H. Powers	Plymouth, N. H	50,000
H. G. Parker	Carson City, Nev	50,000
Seth Weeks	Corry, Pa	100,000
C. J. Huske	Walhalla, S. C	300,000
C. S. White	Romney, W. Va	100,000
S. Wilmot	New Castle, Ontario	500,000
Percy C. Ohl	Plainfield, N. J	50,000
Curtis Johnson	Saint Petersburg, Pa	50,000
Fred Mather	Newark, N. J	500,000

Besides the eggs mentioned in the above table 50,000 were sent on the 21st of September to the New South Wales Zoological Society, Sydney, New South Wales.

There were also sent, on the 28th of September, from Sacramento, by express, to Hon. B. B. Redding, California fish commission, 200,000 eggs; and to the Lenni Fish Propagating Company, Sonoma, Cal., 500,000 eggs.

Allow me to say, in conclusion, that this closes the tenth season of the labors of the United States Fish Commission in taking salmon eggs at this station. During that period nearly 70,000,000 salmon eggs have been taken and distributed, and, though sometimes great difficulties—and some that appeared insurmountable at the time—have been encountered, fortune has favored us through the decade, so that every year of the ten has been a successful one.

Below will be found tables showing—

(*a.*) The daily record of eggs taken.

(*b.*) The number of fish taken in the seine.

(*c.*) The temperature of air and water during the season.

(*d.*) The various collections sent to the Smithsonian Institution.

Table showing the number of female salmon spawned each day and the number of salmon eggs taken each day during the season of 1881.

Date.	Number of fish spawned.	Number of eggs taken.
Aug. 28	35	175,000
29	55	225,000
30	98	370,000
31	81	331,000
Sept. 1	104	439,000
2	172	665,000
3	179	770,000
4	190	945,000
5	221	914,000
6	200	836,000
7	213	875,000
8	181	725,000
Total	1,729	7,270,000

Average number of eggs to fish, 4,205. Average weight of females, 11⅔ pounds.

Table giving list of specimens collected for the Smithsonian Institution.

[Catalogue of alcoholic specimens from McCloud River, California. Contributed by Livingston Stone.]

No.

700. Dolly Varden trout. 1881.
701. Salmon. June, 1881.
702. Salmon. June, 1881.
703. Salmon. June, 1881.
704. Salmon. June, 1881.
705. Salmon, male. August 26, 1881.
706. Salmon, male. August 26, 1881.
707. Salmon, male. August 26, 1881.
708. Salmon, male. August 26, 1881.
709. Jar of trout from trout ponds. 1881.
710. Jar of trout from trout ponds. 1881.
711. Salmon, female. August 31, 1881.
712. Salmon, female. August 31, 1881.
713. Salmon, female. August 31, 1881.
714. Salmon, female. August 31, 1881.
715. Jar containing—
    1 split-tail fish. June, 1881.
    2 young humming-birds. June, 1881.
    1 beetle. June, 1881.
    1 young mole. June 12, 1881.
    1 young rat. June 12, 1881.
    2 spleens. June 16, 1881.
    1 insect. June 16, 1881.
    5 lizard eggs. June 16, 1881.
716. Jar containing gills and viscera of a female salmon that died of the disease prevailing in the McCloud River during the summer of 1881. The spawn was very far advanced but not loose. August 4, 1881. Also viscera of three more. August 5, 1881.

717. Viscera of diseased salmon. July, 1881.
718. Female salmon. August 31, 1881.
719. Female salmon. August 31, 1881.
720. Head of salmon. Gills and eyes partly destroyed by fungus and healed again. July 8, 1881.
721. Jar containing—
1 rattlesnake. June, 1881.
1 king snake. June, 1881.
1 king snake. July, 1881.
1 small striped snake. July, 1881.
1 small snake. June, 1881.
1 lizard. June, 1881.
1 lizard. July, 1881.

Memorandum of nests and eggs of birds collected on the McCloud River from May 29 to June 12, 1881.

1. King oriole. Nest and young.
2. Redheaded woodpecker. Found in stump of tree.
3. Male and female linnet nest and 3 eggs. Found on rafters of barn.
4. Female blue jay. Nest found in tall live oak.
5. Flycatcher (male) and nest.
6. Humming-bird. Nest and 1 egg.
7. Cat-bird and nest.
8. Goldfinch and nest.
9. Unknown nest.
10. Unknown nest.
11. Humming-bird's nest.
12. Quail's nest. Four eggs.
13. Dove and egg. Found in hollow of ground (no other nest).
14. Quail's nest. Seven eggs.
15. Unknown nest. Three eggs.
16. Unknown nest.
17. Sundry unknown nests.
18. Oriole's nest.
19. A yellow-breasted bird and nest.
20. A yellow-bird's nest.
21. Unknown nest and egg.
22. Meadow-lark's nest and 4 eggs.
23. Unknown nest and 2 eggs.
24. Humming-bird's nest.
25. Flycatcher. Nest and 2 eggs.
26. Unknown bird and nest. Found on ground.
27. Unknown bird. Nest and 4 eggs.

List of geological specimens contributed by Livingston Stone.

1. Bones from Cave Bear Cave, McCloud River, California. July 29, 1881.
2. Teeth, McCloud River, California. July 29, 1881.
3. Portion of skull, supposed to be that of a bear, from new chamber of Cave Bear Cave, McCloud River, California. July 29, 1881.
4. Portion of jaw-bone, from new chamber of Cave Bear Cave, McCloud River, California. July 29, 1881.
5. Bones from Cave Bear Cave, McCloud River, California. July 29, 1881.

6 to 12, inclusive. Bones from Cave Bear Cave, McCloud River, California. July 29, 1881.

Table showing the number of salmon taken daily in the seine, with temperature of air and water, during the season of 1881.

[Record of salmon operations conducted at United States Salmon Hatchery, on the McCloud River, California, from August 25, 1881, to September 9, 1881, on account of the United States Fish Commission, by Livingston Stone.]

Date.	Hour.	Temperature of—		Fish taken.		Ripe fish.	
		Air.	Surface water.	Males.	Females.	Males.	Females.
Aug. 25	5.30 p. m.						10
26	5.30 p. m.	70	59	200	100	About one-eighth.	8
28	9.00 a. m.	70	60	200	150	do	27
28	6.30 p. m.	65	59	250	100	do	19
29	7.40 a. m.	64	54	150	100	do	30
29	9.30 a. m.	72	54	150	50	do	12
29	5.15 p. m.	78	58	100	50	do	1
29	5.45 p. m.			15	10	do	2
29	7.10 p. m.	72	60	175	75	do	11
29	8.10 p. m.	63	56	200	200	do	17
29	9.15 p. m.	58	56	250	250	do	11
30	5.20 a. m.	45	54	150	150	do	9
30	5.40 a. m.	45	55	125	125	do	3
30	8.00 a. m.	63	56	100	25	do	12
30	9.30 a. m.	68	54	40	40	do	
30	5.00 p. m.	86	56	25	25	do	2
30	5.30 p. m.	86	56	60	30	do	8
30	7.15 p. m.	66	54	30	30	do	14
30	7.45 p. m.	66	54	300	300	About one-fourth.	16
30	9.15 p. m.	55	54	150	150	do	10
31	5.00 a. m.	45	56	300	300	do	32
31	5.30 a. m.	45	56	50	50	do	5
31	7.12 a. m.	47	56	20	20	do	6
31	9.15 a. m.	65	56	20	5	do	3
31	5.15 p. m.	84	56	75	25	do	10
31	5.40 p. m.	82	55	250	250	About one-eighth.	5
31	7.00 p. m.	72	54	350	350	do	25
31	9.00 p. m.	62	54	250	250	do	10
Sept. 1	5.00 a. m.	48	53	300	300	do	30
1	6.10 a. m.	47	54	200	200	do	15
1	7.30 a. m.	55	54	10	10	do	5
1	9.00 a. m.	62	55	50	50	do	5
1	4.15 p. m.	82	57	250	250	do	28
1	4.40 p. m.	82	56	175	175	do	12
1	7.30 p. m.	75	56	125	125	do	11
1	8.30 p. m.	60	56	150	150	About one-fourth.	11
2	5.15 a. m.	58	56	600	600	do	51
2	6.30 a. m.	57	56	400	400	do	35
2	8.10 a. m.	60	56	150	150	do	14
2	10.00 a. m.	61	56	250	250	do	13
2	4.20 p. m.	71	56	350	350	do	39
2	5.05 p. m.	63	56	200	200	do	17

Table showing the number of salmon taken daily in the seine, &c.—Continued.

Date.	Hour.	Temperature of—		Fish taken.		Ripe fish.	
		Air.	Surface. water.	Males.	Females.	Males.	Females.
Sept. 2	8.20 p. m.	60	51	750	750	do	86
3	5.00 a. m.	50	54	250	250	do	38
3	8.20 a. m.	60	53	300	300	do	54
3	10.00 a. m.	69	54	240	110	do	41
3	4.25 p. m.	80	57	250	250	do	45
3	7.40 p. m.	60	55	800	800	do	118
4	9.10 a. m.	73	55	300	300	One-half	32
4	10.40 a. m.	80	56	250	150	do	22
4	11.15 a. m.	80	56	150	150	About one-half.	26
4	4.45 p. m.	85	57	255	255	do	27
4	7.40 p. m.	78	58	400	400	Nearly all	137
5	7.30 a. m.	67	56	300	300	do	95
5	9.30 a. m.	73	56	150	150	do	42
5	11.30 a. m.	80	57	25	25	do	6
5	7.00 p. m.	76	60	800	400	do	156
6	8.00 a. m.	70	54	200	200	do	64
6	10.10 a. m.	80	54	200	150	do	16
6	11.20 a. m.	81	55	200	200	do	21
6	4.40 p. m.	77	58	150	150	do	20
6	7.35 p. m.	64	55	200	200	do	39
6	8.00 p. m.	64	55	300	300	do	25
7	5.30 a. m.	52	54	200	100	do	13
7	6.15 a. m.	52	54	125	125	do	15
7	7.35 a. m.	57	55	110	110	do	8
7	9.45 a. m.	78	55	200	200	do	46
7	11.55 a. m.	87	56	150	150	do	6
7	2.30 p. m.	92	57	125	125	do	9
7	4.00 p. m.	92	57	50	50	do	6
7	5.15 p. m.	88	58	275	275	do	20
7	5.40 p. m.	73	58	100	100	do	8
7	7.15 p. m.	66	56	130	130	do	20
7	8.40 p. m.	65	54	250	200	do	27
8	6.00 a. m.	48	54	175	175	do	28
8	7.50 a. m.	50	54	200	150	do	18
8	9.20 a. m.	70	56	160	160	do	24
8	10.30 a. m.	74	56	125	125	do	8
8	11.50 a. m.	87	57	115	115	do	11
8	4.35 p. m.	82	58	50	50	do	12
8	5.50 p. m.	80	57	50	25	do	0
8	7.15 p. m.	68	54	150	150	do	24
8	7.50 p. m.	66	54	300	200	do	16

Table of temperatures taken at the United States salmon-breeding station, McCloud River, California, during the season of 1881.

Month.	Air.				Water.			Wind, 7 a. m.	Weather.
	Shade.			Sun.					
	7 a. m.	3 p. m.	7 p. m.	3 p. m.	7 a. m.	3 p. m.	7 p. m.		
	°	°	°	°	°	°	°		
Apr. 16	49	55	.....	.....	57	51	.....	SW.	Rain.
17	48	56	.....	.....	50	50	.....	SW.	Do.
18	49	56	.....	.....	50	50	.....	SW.	Do.
19	49	.....	.....	91	51	.....	.....	SW.	Clear.
20	49	57	.....	92	50	50	.....	.....	.....
21	48	58	.....	.....	50	.....	.....	.....	Rain p. m.
22	48	58	.....	.....	50	.....	.....	.....	Showers.
23	49	57	.....	.....	49	49	.....	.....	Rain a. m.; clear p. m.
24	42	70	.....	96	.....	.....	.....	.....	Clear.
25	43	74	.....	100	50	51	.....	.....	Do.
26	53	79	.....	104	51	53	.....	S.	Do.
27	49	.....	.....	105	51	.....	.....	S.	Do.
28	54	85	.....	110	52	56	.....	S.	Do.
29	55	86	.....	114	.....	56	.....	S.	Do.
30	55	.....	.....	.....	52	.....	.....	S.	Do.
May 1	.....	80	.....	100	.....	57	.....	S.	Do.

Table of temperatures taken at the United States salmon-breeding station, &c.—Continued.

Month.	Air. Shade. 7 a. m.	Air. Shade. 3 p. m.	Air. Shade. 7 p. m.	Air. Sun. 3 p. m.	Water. 7 a. m.	Water. 3 p. m.	Water. 7 p. m.	Wind, 7 a. m.	Weather.
	°	°	°	°	°	°	°		
May 2	55	78	.....	96	54	58	.....	S.	Clear.
3	55	84	.....	109	54	57	.....	S.	Do.
4	53	79	.....	81	54	55	.....	S.	Rain through night.
5	50	80	.....	96	54	.....	.....	S.	
6	60	78	.....	104	52	54	.....	S.	Clear.
7	56	.....	.....	.....	52	52	.....	S.	Rain.
8	59	68	.....	.....	53	55	.....	S.	Heavy rain.
9	61	65	.....	82	54	54	.....	S.	Clear.
10	47	.....	.....	91	50	52	.....	NW.	Do.
11	57	84	.....	94	51	52	.....	NW.	Do.
12	56	77	.....	89	53	56	.....	NW.	Do.
13	.....	86	.....	106	53	56	.....	NW.	Do.
14	58	86	.....	104	53	57	.....	NW.	Do.
15	59	.....	.....	.....	54	.....	.....	NW.	Do.
16	65	84	.....	101	53	56	.....	NW.	Do.
17	.....	85	.....	98	.....	56	.....	NW.	Do.
18	56	90	.....	106	53	56	.....	NW.	Do.
19	55	91	.....	111	54	57	.....	NW.	Do.
20	58	88	.....	100	55	58	.....	NW.	Do.
21	60	75	.....	88	55	57	.....	NW.	Cloudy.
22	60	60	.....	90	55	57	.....	S.	Clear.
23	51	72	.....	.....	52	54	.....	NW.	Do.
24	51	79	.....	91	52	55	.....	SW.	Do.
25	57	86	.....	101	52	56	.....	NW.	Do.
26	57	80	.....	82	54	56	.....	NW.	Do.
27	54	81	.....	52	53	54	.....	NW.	Do.
28	51	.....	.....	.....	52	.....	.....	NW.	Do.
29	.....	85	.....	100	.....	56	.....	SW.	Do.
30	60	69	.....	.....	53	54	.....	.....	Do.
31	61	79	.....	105	52	57	.....	.....	Do.
June 1	63	84	.....	109	55	58	.....	SW.	Do.
2	62	85	.....	102	56	58	.....	SW.	Heavy rain; thunder.
3	63	67	.....	.....	56	56	.....	SW.	Clear a. m.; rain p. m.
4	59	81	.....	103	53	57	.....	SW.	Heavy rain at night.
5	60	73	.....	.....	53	56	.....	SW.	Clear.
6	61	66	.....	.....	53	55	.....	SW.	Do.
7	53	66	.....	.....	52	53	.....	S.	Do.
8	55	68	.....	.....	52	54	.....	S.	Do.
9	.....	77	.....	97	54	55	.....	NW.	Do.
10	61	68	.....	.....	.....	55	.....	S.	Do.
11	.....	77	.....	82	.....	57	.....	S.	Do.
12	.....	84	.....	101	.....	58	.....	NW.	Do.
13	62	80	.....	.....	54	59	.....	.....	Cloudy.
14	63	84	.....	.....	53	59	.....	.....	Clear.
15	63	84	64	108	54	59	56	.....	
16	62	85	.....	114	54	58	.....	.....	
17	.....	86	66	109	.....	59	56	N.	
18	65	81	.....	94	55	59	.....	S.	
19	.....	70	66	93	.....	59	.....	S.	
20	60	75	65	94	55	58	57	S.	
21	64	82	68	108	54	58	57	NE.	
22	64	89	79	110	55	58	50	NE.	
23	61	91	.....	103	55	.....	.....	.....	
24	61	90	78	114	56	60	60	.....	
25	64	94	.....	116	57	60	.....	.....	Hazy.
26	68	96	80	124	57	61	60	.....	
27	68	97	82	123	57	61½	61	NW.	
28	68	84	80	103	58	61½	61	SW.	
29	60	73	69	84	57	59	58	SW.	Clear.
30	53	74	70	89	55	60	57	SW.	Do.
July 1	54	79	74	106	55	57	57	SW.	Do.
2	52	72	64	92	55	57	56	SW.	Do.
3	.....	90	71	110	.....	57	57	NE.	Do.
4	58	95	.....	122	55	59	.....	NE.	Do.
5	55	94	84	117	55	60	59	SW.	Do.
6	54	87	74	111	56	60	58	SW.	Do.
7	62	84	77	105	55	58	58	NE.	Do.
8	62	78	77	97	55	57	56	SW.	Do.
9	53	80	74	102	53	58	58	SW.	Do.
10	.....	91	81	115	56	60	59	NE.	Do.
11	72	93	81	116	56	60	60	NE.	Do.

XXII.—REPORT OF OPERATIONS AT THE UNITED STATES TROUT PONDS, M^cCLOUD RIVER, CALIFORNIA, FOR THE SEASON OF 1881.

By Livingston Stone.

Hon. Spencer F. Baird:

Sir: I beg leave to report as follows: At the date of my last report, December 31, 1880, everything at the trout-hatching station on the McCloud River appeared to predict an unusually prosperous season. No exertion had been spared to collect breeding fish for the ponds, and it is estimated that at the beginning of the year the ponds contained 3,000 very large breeding trout, none of which weighed less than a pound, while half of them weighed over five, and a few upwards of eight pounds. The average weight of the whole number was not less than three pounds. It was undoubtedly the finest collection of living trout in America, if not in the world. They would easily have yielded nearly a million eggs. But the bright promise of Christmas week was doomed to bring only disappointment and disaster. As I said, everything was favorable at that time. There had been no great rainfall up to the 1st of January, the trout were healthy and doing well, the water was good, the spawning time was close at hand, and the trout ponds seemed to be on the verge of a great success. But never were appearances more deceitful. In January it began to rain as it had never rained before in this region since white men came here. Four solid feet of water, lacking an inch, fell at Shasta City during this month, and here in the mountains the rainfall must have been much greater. The McCloud rose to an alarming height, but still no danger was apprehended at the trout ponds, because this station was built so far above the river, and no injury did come from the rise in the river. The mischief that was done proceeded from an entirely unexpected source, which well illustrates the fact that in a new country like this when trouble begins no one can tell what will come next.

The calamity that befell the trout, and it was a most serious one, was caused directly by *mud*, and only indirectly by water. The enormous volume of water poured down from the sky almost literally liquified the soil on the hill-sides, so that it actually flowed down into the valleys below. In some instances on a steep hill-side a whole acre of soil to an

unknown depth, completely saturated with water, would in this way flow down into the gulch beneath.*

The effect on the creeks into which this enormous mass of earth descends is indescribable.

The first result is that the creek is completely dammed up by the avalanche. Now, if this were a dam of dry earth the creek would rise till it overflowed the crest of the dam, and then, cutting a channel over the top, it would finally wear a gap down through the dam to its own natural level. But in this case, instead of being dry earth, the dam is almost mud, and the water above it as it rises pushes this saturated mass before it instead of waiting to rise up over it, and mingles with it, the whole commingled mass then flowing down through the cañon to the river below.

What has just been described as happening to creeks generally when land-slides occur from an excessive rainfall is what actually occurred in the stream on which the United States trout ponds are built. The consequences to the ponds were terrible. The trout-pond station was built so far above the McCloud that the river could not reach it. It was also so guarded from high water in the creek that the floods could not reach it in that direction.. But for this invasion of mud no provision had been made. It had not even been dreamed of, nor did the possibility of its occurring ever enter any one's mind until it came.

As the mass of mud rolled down the creek towards the ponds nothing could be done but to let it come into the ponds, because to shut off the mud would also shut off the water-supply from the trout, which would soon be fatal. On it came, increasing in volume till it began to fill the upper trout pond. In a very short time this pond was filled nearly to the top with mud, and then the men had to get into the pond and shovel out the mud. By the time this pond was excavated it was time

* These land-slides furnished a rude and rather novel method of determining what could be discovered in no other way, namely, the intervals at which great rains have fallen in past generations. It is as follows: The size of these land-avalanches corresponds very considerably with the amount of rainfall at the time the slide occurred. The greater the rainfall the larger the slides, so that when a very large slide is found we know that when the slide occurred there was a very large rainfall. Now, as vegetation begins very soon to cover a land-slide after it has subsided, it follows that the age of a slide occurring in past seasons can be approximated by ascertaining the age of the vegetable growth above it. For instance, if we find that a very large slide has occurred in some place we know that there must have been a very large rainfall the year that the slide moved, and if we find a tree a hundred years old growing on the slide we know that it must have been over a hundred years since the great rainfall came which made the slide.

A good illustration of this is furnished by the experience of Mr. J. B. Campbell, who found the remains of a very large land-slide on Town Creek, near Pittsburgh, about 10 miles from the fishery. The size of this slide indicated that when it occurred there must have been as great a flood as there was last winter. Now, there was a tree growing on this slide which on being felled was found to be two hundred years old. We know, therefore, that upwards of two hundred years ago there was a season when there was a very heavy rainfall.

to dig out the lower pond. No screens or nettings availed anything, for they became completely clogged up in a moment. This went on for eight nights and days, and so great was the accumulation of earth in the creek channel where the slide occurred that it was two weeks before the mud subsided so as not to require constant attention.

The direct mischief which it caused, of filling up the ponds, was bad enough, but the ulterior injury resulting from it was worse. This arose from the mud getting into the gills of the trout and producing an inflammation in them. Some were killed from it immediately, others survived for some weeks and even months, but succumbed at last. The total loss was very great, for when summer came there were not over a thousand fish left of the magnificent collection which the ponds contained in the fall. Those, however, which were left alive, on the 1st of June were all healthy, and no more deaths occurred after that time from inflamed gills.

During all this trying time of the floods, there were only four white men at the trout-pond station, and the labor and hardships entailed upon them were very great. These four men were Mr. Myron Green, Mr. Loren Green, Mr. Robert Radcliff, and Mr. George Hume. The energy and courage with which, for two weeks, in the solitude of these mountains and with the rain pouring down in more than torrents, they combatted with an enemy wholly unknown to them before, and which could neither be overcome nor successfully resisted, entitles them to a great deal of credit. They certainly showed no hesitation in encountering hardships and exposure which could not be expected of them for any mere pecuniary compensation.

By the end of the month of February the rainfall had very much decreased, and, though there were times when great vigilance and care were necessary, no serious trouble occurred after the 1st of March.

It so happened that the trout began to spawn just before the time of the highest water. The spawning season opened very auspiciously, and Mr. Myron Green, who had charge of the trout ponds, sent to the railroad station at Redding on the 26th of January 75,000 trout eggs for distribution at the East.*

At this time Pit River, 7 miles south of the trout ponds, was very high, though not quite impassable, and Mr. Green succeeded, at considerable risk, in getting the eggs across the Pit. By the time they reached the Little Sacramento at Reid's Ferry this river had become all but impassable, and no one could be found who was willing to venture to cross it. The eggs consequently lay there several days. In the meantime the floods had spread over the whole country, and the California Pacific Railroad for a hundred miles below Redding was more or less under water. The consequence was that the trout eggs spoiled in the crates long before they could be started on their eastern journey. I know

*These eggs were directed as follows: T. B. Ferguson, Baltimore, Md., 25,000; B. F. Shaw, Anamosa, Iowa, 25,000; N. K. Fairbanks, Geneva Lake, Wis., 25,000.

that some dissatisfaction was felt by the eastern consignees of these eggs, but if they could realize the difficulties which had to be encountered at the other end of the route in shipping the eggs they would not want to attach any blame to any one.

It was over three weeks before the waters had subsided sufficiently to allow the forwarding of any more trout eggs, and it was not till the 18th of February that Mr. Green succeeded in getting any through to Redding, Cal., which is the terminus of the California Pacific Railroad and the nearest railroad point to the McCloud River trout ponds. On the 18th of February 25,000 eggs were sent to Hon. B. B. Redding, secretary of the California Fish Commission at San Francisco. On the 19th 15,000 more were sent to Mr. Redding, and on the 23d of February 10,000 were forwarded to Mr. N. K. Fairbanks, of Chicago, Ill., and 10,000 to Mr. B. F. Shaw, of Anamosa, Iowa. From that time until May 1 Mr. Green continued at intervals to ship eggs to eastern points. There were still occasional washouts in various places on the overland roads, so that many of the eggs were sixteen or seventeen days making a journey of five, in consequence of which some lots were lost en route. On the other hand, where no delays occurred, the eggs went through in good order. There will be found appended to this report a memorandum of the distribution of trout eggs from this station.

There was one result of the land slides that made us a good deal of work, and this was that in many places portions of trails that we had built along the hill-sides slid away entirely, so that not a vestige of a path was left. This often happened where the slide itself was only a small one. There are fifteen miles of trails along the river that we keep in repair, and we had spent a good deal of time and labor upon them in order to facilitate the bringing in of the live trout that were caught for the ponds; and it was a work of no small magnitude to get these trails into good order again after the injuries caused by the rains.

When the rebuilding of the salmon fishery began, about the 1st of June, most of the trout-pond force came down to the salmon-hatching station to assist in the work there, only one or two men remaining at the trout ponds, and their time was chiefly occupied in taking care of the breeding trout, in capturing wild ones, and in making general repairs and improvements about the place. The condition of the trout continued to improve throughout the summer, and on the 1st of September they were all in splendid condition. I may add here that their food in winter is mostly beef, venison, and dried salmon. In summer it is chiefly boiled salmon, with beef and venison, often enough to keep them in good condition.

I mentioned in my report on the salmon-hatching station that during a short period in July and in August, a large number of salmon in the McCloud River died of a mysterious disease. A good deal of alarm was felt when it was reported one morning that the disease had extended to

the trout in the river, and that they also were dying like the salmon. The alarm was a very short-lived one, however, for the mortality among the trout only lasted a few days, and it was found upon investigation that only a very few trout died, and it is quite possible that these were made sick by feeding on the salmon that had died of the disease. No trout in the ponds were affected by the sickness at all, which showed at least that the cause of the mortality among the trout, whatever it was, did not extend up into the creeks.

After the season closed at the salmon-breeding station in October, the fishing for parent trout was vigorously prosecuted, and much hard work was done in repairing the trails and catching and bringing to the ponds live trout, which had to be carried in some instances several miles.

The winter's wood was also cut and brought in, and on the ditch which takes the water from the creek to the trout ponds a deep pond was sunk a short distance above the trout ponds, to catch the mud that is brought down by the water in the ditch.

No great rains fell during the fall up to the present writing (December 31). The river had not risen to any considerable extent except once, when it was 4 or 5 feet above the summer level. The breeding trout at present in the ponds are looking well, and unless there is an excessive rainfall like that of last winter there seems to be no reason why we should not take several hundred thousand eggs during the next spawning season, the beginning of which now appears to be close at hand.

Table showing the distribution of California trout (Salmo irideus) eggs from the McCloud River station in 1881.

1881.		
Jan.	26. T. B. Ferguson, Maryland	25,000
	26. B. F. Shaw, Iowa	25,000
	26. N. K. Fairbanks, Illinois	25,000
Feb.	18. B. B. Redding, California	25,000
	19. B. B. Redding, California	15,000
	25. N. K. Fairbanks, Illinois	10,000
	25. B. F. Shaw, Iowa	10,000
March	4. S. Webber, New Hampshire	4,000
	14. T. B. Ferguson, Maryland	700
	31. T. B. Ferguson, Maryland	10,000
April	7. T. B. Ferguson, Maryland	700
	16. J. G. Portman, Michigan	6,000
	16. R. O. Sweeney, Minnesota	8,000
	29. Philo Dunning, Wisconsin	5,000
	29. William Griffith, Kentucky	5,000
	29. J. P. Creveling, Pennsylvania	5,000
	29. Eugene G. Blackford, New York	500
Total		179,900

XXIII.—REPORT ON THE PROPAGATION OF PENOBSCOT SALMON IN 1881–'82.

By Charles G. Atkins.

The routine work of the season went on with so little novelty that there is not much to report beyond the summaries of work accomplished.

It has been the ordinary practice to defer the purchase of salmon until the market price has declined to about twenty-five cents per pound. This generally happens from June 1 to 10, depending mainly on the supply of salmon from Canadian rivers.

This year the first salmon were received June 1, and the last July 2, the supply coming from the same parties and the transfer being in the same hands as the previous year. The total number bought was 514; 5 of them died in transit, and 509 were deposited in apparently good condition in the inclosure. They were of uncommonly large size, the average being 16.55 pounds, as estimated by Mr. Whitmore—doubtless a very close approximation to the actual weight. This is the largest average that has occurred since the propagation of Penobscot salmon began, in 1871. It is thought by the fishermen to be the highest within their experience. The next highest since 1870 was the season of 1874, when the average of those purchased reached 14.03 pounds. Another phenomenon worthy of notice is the fact that the average size of the fish was as great during the last days of purchase as during the earliest. The ordinary experience of fishermen is that the mean weight of the fish decreases from the beginning to the end of the season.

The mortality in the inclosure was this year remarkable, 146 being found dead. No progress has been made toward a discovery of the cause. The symptoms were, as before, an opacity of the eyes, (accompanied, doubtless, by total blindness), subsequent protrusion and bursting of the eye, and, soon after this, of the fish. Ninety-six per cent. of these deaths occurred in June and July. This agrees with previous experience, which teaches us to expect the survival of nearly all those that reach the month of August alive. The greatest heat of the water generally occurs in August. This year the averages were as follows: from May 19 to 31, 57.8° F.; June 1 to 30, 59.4° F.; July 1 to 31, 63.5° F.; August 1 to 31, 63.7° F.; September 1 to 30, 59° F.; October 1 to 31, 45.8° F. The highest temperature noted was 73° F., August 6. The mean for the first eight days of August was 70.9° F. These averages are

based on observations made exclusively in the morning, from 5 to 7 o'clock, generally precisely at 6. Midday temperatures were undoubtedly higher.

The recapture of the salmon in October was successfully accomplished, but four fish eluding us; 358 of both sexes were manipulated, 232 females and 126 males. The females (135 were measured) averaged 33.37 inches in length; 15.67 pounds in weight before spawning, 11.85 pounds after spawning. The males (71 were measured) had a mean length of 34.8 inches and a mean weight of 13.6 pounds. There were obtained 515 pounds of spawn, counting as afterwards ascertained, 2,693,009 eggs. The average yield was 11,608 eggs from each female. As compared with former experience, these means are all much higher, indicating the accuracy of the estimate of weight made when the salmon were purchased. The first eggs were taken October 26, the last November 17.

At the hatching we had, previous to this season, used water directly from the brook, tapping it within 50 feet of the house. The original supply is from "Craig's Pond," a very pure natural lakelet as cold as ordinary lakes in this latitude. But a few hundred feet above the hatchery it receives the waters of some copious springs which have the effect of maintaining a high temperature in the lower part of the brook during the early part of the winter, and thereby forcing the eggs into early development. In 1879 and 1880 we were forced to pack and ship the most forward lots of spawn early in December—a very inconvenient date—and all of them were ready for shipment earlier than it is supposed would be best for the young fish, if hatched in northern localities. In the winter of 1880-'81 a temporary hatchery was constructed on the brook above the point where the springs enter, to retard the development of a portion of the spawn, and served an excellent purpose, although it was in many respects unsatisfactory. It appeared on the whole advisable to conduct a supply of cold water into the main hatchery, and an aqueduct was projected, tapping the brook above the springs. This was executed in August and September, 1881. It was built of cement mortar, laid around a wooden core four and a half inches in diameter, the core being drawn ahead as fast as the cement set. It is believed to be practically permanent, being laid at the bottom of a trench below the reach of frost. It is about 1,600 feet long, and cost $737.30. In the hatchery we have, therefore, a choice, during late fall and early winter, between warm and very cold water.

In 1881 the spawn was kept at first wholly in the aqueduct water, which had a mean temperature through November of 40.7° F., and through December of 35.2° F. The brook, meanwhile, had a temperature of 47.4° F. in November and 41° F. in December. The lower temperature of the former enabled us to hold back the earliest eggs until the middle of January, more than a month later than in 1880.

The first shipments were made January 16, 1882, and to suit the con-

venience of consignees the last of them were held until March 13. The eggs were, as usual, packed in wet moss, inclosed in dry leaves or chaff, and forwarded by express.

The eggs rejected for lack of impregnation numbered 50,550; those rejected for whiteness, from time to time through the season, numbered 28,459; I suppose that 20 per cent of the latter may have been impregnated; and this gives us 56,242 as the whole number of eggs that failed of impregnation, being 2.2 per cent of those taken from the fish—surely a very satisfactory result.

The eggs remaining at time of shipment, measured out in tin cans, amounted to 2,614,000; if to these we add those rejected, we obtain 2,693,009 as the original number taken from the fish.

Divided pro rata among the parties supporting the establishment, the eggs were assigned as follows:

To the United States	1,006,500
To Maine	1,147,000
To Massachusetts	286,000
To Connecticut	172,000
Total shipped	2,611,500

The transfer of all those eggs was accomplished with a loss of but 1,739, of which the greater number were probably unimpregnated eggs that escaped the scrutiny given to the spawn before shipment. The hatching was also attended with excellent success at nearly all points, and as the net result of the year's work there were planted in the waters of the country 2,397,132 salmon fry, as shown in detail in Table III.

TABLE I.—*Schedule of breeding salmon bought at the Bucksport-Orland establishment*, 1881.

Date.	Number of salmon received.	Aggregate weight.	Average weight.
1881.		*Pounds.*	*Pounds.*
June 1	18	297	16.50
2	19	277	14.62
3	44	694.2	15.80
4	42	707.4	16.84
6	35	621.2	18.03
7	22	347.6	15.80
8	33	537.1	16.28
10	12	176.7	14.72
11	20	271	13.55
13	15	214	14.27
14	13	252	19.38
15	19	259	13.63
16	30	494.6	16.49
17	17	285	16.76
18	21	355	17.85
20	36	596	16.56
23	18	296	16.44
25	23	425	18.48
27	20	339.5	16.97
29	30	563.3	18.77
July 2	17	312	18.35
11	10	182.7	18.27
Total	514	8,503.3	16.55

TABLE II.—*Transfer of Penobscot salmon eggs from Orland, Me.*, 1882.

Date.	Consignee.	Address.	Final Destination.	No. of cases.	Number of eggs.			Date of unpacking.	Condition on unpacking.	No. eggs dead.
					Belonging to States.	Belonging to United States.	Total.			
1882.										
Jan. 16	A. H. Powers	Plymouth, N. H	Plymouth, N. H	1	80,000		80,000	Jan. 18	"Good"	39
16	E. A. Brackett	Winchester, Mass	Winchester, Mass	1	40,000		40,000		"Good"	339
16	H. J. Fenton	Windsor, Conn	Poquonock, Conn	1	80,000		80,000	Jan. 18	"Good"	17
19	E. G. Blackford	New York, N. Y	Roslyn, N. Y	2		120,000	120,000	Jan. 29	"Excellent"	144
23	H. J. Fenton	Windsor, Conn	Poquonock, Conn	2		95,000	95,000	Jan. 26	"Good"	26
23	E. J. Anderson	Bloomsbury, N. J	Bloomsbury, N. J	2		95,000	95,000	Jan. 26	"Good"	8
23	E. G. Blackford	New York, N. Y	Roslyn, N. Y	1		80,000	80,000	Feb. 5	"Excellent"	37
25	Chas. G. Atkins	Grand Lake Stream, Me	Grand Lake Stream, Me	1	20,000		20,000	Jan. 30	"Excellent"	23
Feb. 8	do	do	do	3	130,000	50,000	180,000	Feb. 12	"Good"	3
9	E. G. Blackford	New York, N. Y	Roslyn, N. Y	1		37,500	37,500	Feb. 19	"Excellent"	93
9	A. H. Powers	Plymouth, N. H	Plymouth, N. H	3	80,000	95,000	175,000	Feb. 11	"A No. 1"	145
9	H. J. Fenton	Windsor, Conn	Poquonock, Conn	1	85,000		85,000	Feb. 14	"Good"	86
13	E. G. Blackford	New York, N. Y	Roslyn, N. Y	1		50,000	50,000	Feb. 19	"Excellent"	115
13	Dr. R. O. Sweeny	Saint Paul, Minn	Saint Paul, Minn	3		200,000	200,000	Feb. 19	"Good"	51
13	Seth Weeks	Corry, Pa	Corry, Pa	2		100,000	100,000	Feb. 17	"Good"	62
14	O. A. Dennen	Mount Kineo, Me	Mount Kineo, Me	3	200,000		200,000	Feb. 17	"Good in fine condition"	50
14	A. H. Powers	Plymouth, N. H	Plymouth, N. H	1	70,000		70,000	Feb. 15	"Good"	250
15	F. C. Howey	Rangely, Me	Rangely, Me	3	200,000		200,000	Feb. 20	"Very good"	15
15	J. R. Dillingham	Songo Lock, Naples, Me	Songo Lock	2	100,000		100,000	Feb. 19	"Good"	12
16	Ellis Hanscom	Machias, Me	Machias, Me	1	30,000		30,000	Feb. 21	"Good"	16
16	D. H. Harmon	Norway, Me	Norway, Me	2	100,000		100,000	Feb. 18	"Good"	54
21	A. J. Darling	Enfield, Me	Enfield, Me	5	300,000		300,000	Feb. 22	"Good"	25
Mar. 7	Chas. G. Atkins	Grand Lake Stream, Me	Grand Lake Stream, Me	1	67,000		67,000	Mar. 11	"Good"	17
7	H. J. Fenton	Windsor, Conn	Poquonock, Conn	1	7,000		7,000	Mar. 9	"Good"	2
7	A. H. Powers	Plymouth, N. H	Plymouth, N. H	1	16,000		16,000	Mar. 8	"Good"	10
13	S. F. Baird	Washington, D. C	Wytheville, Va	1		27,000	27,000	Mar. 18	"First class"	13
13	E. G. Blackford	New York, N. Y	Roslyn, N. Y	1		57,000	57,000	Mar. 17	"Excellent"	87
			Total	47	1,605,000	1,006,500	2,611,500			1,739

TABLE III.—*Planting of Penobscot salmon fry reared from eggs gathered in* 1881.

State.	Where hatched.	Water stocked.	Tributaries in which fry were placed.	Locality of deposit.	Date of transfer.	Number of fish set free.
Connecticut	Poquonock	Mill River		Southport, Fairfield County		10,000
		Connecticut River	West Branch Farmington River	Riverton		255,450
Maine	Enfield	Penobscot River	Cold Stream	Enfield	June 10	10,000
		do	do	do	June 11	20,000
		do	do	do	June 15	30,000
		do	Mattawamkeag River	Danforth	June 13	40,000
		do	do	do	June 14	40,000
		do	do	do	June 15	55,000
		do	do	Bancroft	June 16	40,000
		do	do	do	June 19	40,000
		do	Main River	Lincoln	June 20	22,000
	Grand Lake Stream	Saint Croix River	Grand Lake	Hinkley, Washington County	May 22, 30	266,214
	Machias	Machias River	Brooks and streams	Near Machias	June —	29,800
	Mount Kineo	Kennebec River	Moosehead Lake and tributaries		June —	198,000
	Naples	Presumpscot River	Tributaries Sebago Lake	Cumberland County	May —	30,000
	Norway	do	Crooked River	Ryefield Bridge	May —	40,000
		do	do	Steep Falls	May —	58,919
	Rangely	Androscoggin River	Kennebago and Rangely streams	Rangely, Franklin County	June 15	194,600
Massachusetts	Winchester	Merrimac River	Nashua River			36,000
New Hampshire	Plymouth	do	Pemigewasset River			334,302
Minnesota	Saint Paul	Saint Louis River		Fond du Lac	Apr. 27	70,000
		do		do	May 3	70,000
		do		do	May 10	59,750
New York	Roslyn	Hudson River	Carr's Brook	Warren County		35,000
		do	Balm of Gilead Brook	do		40,000
		do	Glen Brook	do		50,000
		do	Ramont Brook	do		45,000
		do	Gulf Brook, &c			55,000
		Salmon River	Beaver-dam Brook	Oneida County		25,000
		do	Trout Brook	do		20,000
		Clapham's Brook		Glen Head, L. I		10,500
		Stream tributary to South Bay.		Long Island		1,000
Pennsylvania		Delaware River	Marshall's Creek	Near Shawnee, Monroe County	Apr. 22	30,000
		do	do	do	Apr. 24	30,000
		do	do	do	Apr. 25	32,417

XXIV.—REPORT ON THE PROPAGATION OF SCHOODIC SALMON IN 1881–'82.

By Charles G. Atkins.

1.—Preparations.

Hatchery No. 3 was the principal scene of activity during August, September, and October, 1881. The location of this hatchery is an exceedingly favorable one, and it is a matter of regret that the facilities existing at this spot were not discovered at the initiation of the establishment. The ground was, in its original condition, heavily strewn with bowlders, large and small, and beneath them were interstices through which the water of the spring stole away in such a manner as to give the impression that the supply was not only small but inconstant. It was only after the tangled maze of shrubs was torn away and part of the surface earth removed that the permanent character of the spring could be observed. Meanwhile three other sites had been occupied, and the main part of the work of developing the spawn and hatching the reserve had been for years carried on at great disadvantage with an inadequate supply of water (spring water at that), no facilities for aeration, and a liability to occasional flooding by rains. I make no doubt that all the serious losses which during the early years occasionally befell the stocks of eggs in development and transportation might have been avoided had we then possessed the facilities of hatchery No. 3. Among the minor disadvantages which we might have escaped may be mentioned the labor and risk of carrying the eggs by hand from the fishing grounds over half a mile of rough road, often by night; the difficulty of guarding well the property so far out of sight and hearing; and the many weary days spent by Mr. Munson in the transfer of the young fish from the house to the stream in the month of June, amid tormenting clouds of mosquitoes and black flies. The new hatchery is at the head of a small cove that indents the west shore of Grand Lake within a few rods of its outlet, and not over 20 feet from the water's edge when the lake is full, as is always the case in June. The fish cans are taken in a boat, and easily rowed to the place of liberation, with great economy of time and effort. The fishing and spawning ground is not over 300 feet distant and almost in sight. Within stone's-throw, an excellent site for the superintendent's house has been secured, and will be occupied another season, so that the premises

will always be under surveillance. The surface of the ground presents a steep incline, of which advantage has been taken to arrange the floors of the hatchery in a descending series, with a total difference in elevation of about 11 feet. The water is introduced upon the highest of the six floors devoted to the development of the embryos, with ample room for aeration and reaeration at each plunge. The latter circumstance atones for the small minimum volume (9 gallons per minute was the lowest observed this season), and in part for the fact that it is wholly spring water. The volume is least from August to early March, after which the spring rains and the melting of the snows produce so great an augmentation that there is a great surplus during all the season of hatching the reserved spawn and growing the alevins. The minimum volume can be augmented by the introduction of water from other, not very distant, springs.

This house was founded in haste, in December, 1880, and was at first only 30 feet long and 20 wide, but this season we have added wings that increase the floor area to about 1,500 square feet. The floors have all been cemented, and the foundation walls, of massive masonry carried up to a height of from 1 to 8 feet above the ground. Cement pipes were laid to introduce the water from the principal spring, and an aqueduct, partly of bored logs and partly of assorted gravel, brings in the water from another spring 600 feet distant. This will henceforth be the headquarters of the establishment. Here the eggs will be packed for shipment, and the reserve hatched. Here will be the storerooms and workshops.

The fixtures for the development of the eggs are similar to those in use at the other houses and also at the Penobscot establishment. Plain wooden troughs are furnished with movable frames in which the egg-trays are arranged in tiers ten deep, with provision for change of water by a horizontal current. A single new feature has been introduced in the method of aeration. Two troughs are placed side by side and the water allowed to pour from one to the other nearly the whole length, exposing a very broad and thin current to the action of the air, and increasing the opportunity of aeration probably twenty-fold over that afforded by a connecting open spout 6 inches wide. In a rough way it may be estimated that by the repeated use of this arrangement in the new house a gallon of water there is fully equal in efficiency to five gallons in hatchery No. 1.

No change has been made in the location of the fishing ground or the fixtures and appliances pertaining to the work of spawning, except trifling alterations in the form and proportions of the inclosures.

2.—Fishing and spawning.

The spring fishing of 1881 was much better than usual, both as regards the numbers and size of the fish taken. Through the summer there was more rain than usual, and in August and September the lake and

the stream were higher than any year since 1875. A sudden rise of water, owing to copious rains in August, 1880, had been followed by an abundance of fish in the stream early in September. The high water of 1881 did not have the same effect on the fish, scarcely any salmon entering the stream till after the middle of September. The inference naturally suggested is that the condition of the stream favorable to a late summer or early fall run of salmon is not so much a high stage of water as a sudden rise; but the phenomena observed are hardly sufficient for confident generalization. Moreover, during ten days in August the gates at the dam were closed for certain repairs on a dam at Calais, and meanwhile the flow of water was confined to that entering the canal. From August 3 to September 10 there was a fall of 5¼ inches, and from September 10 to October 29 a further fall of 15½ inches; November 5, a rise of 2 inches, owing to rains on the two preceding days; and after that date there was neither rise nor fall until December.

The usual nets were placed across the stream and canal about the middle of September, but no preparations for the capture of the salmon were made until October 29, when it was observed that the most forward of them had begun to form their redds above our nets. On the night of October 31 the capture of fish began. The manipulation was delayed until November 8, when some hundreds of salmon had been collected, and a part of them exhibited great uneasiness, a few actually beginning to spawn in the inclosures. The work proceeded as usual until November 19, when all the salmon taken had been deprived of their spawn, and the almost entire cessation of the catch told that the season was at a close.

An accident during the work of spawning confused the different lots of fish so that the number taken from day to day cannot be stated with the usual accuracy, but the tally-book shows exactly the number of females that were manipulated, and enables me to make an estimate of the total number of males, which, I am very confident, is within 15 of the true number. According to these estimates there were taken 652 female salmon, 370 males, and one of unknown sex—total, 1,023. There were 621 females that yielded spawn, and the eggs obtained from them are estimated at 947,000, being an average of 1,525 eggs from each female.

3.—Shipment of spawn.

The development of the eggs intended for earliest shipment was carried on in hatchery No. 3, the remainder being kept in the colder water of No. 2. It is from the latter that the reserve is always selected, since the retardation of their development will bring them out in the spring much nearer the natural date than if developed in the warmer water.

The shipment of eggs began January 12 and closed March 1. The losses up to the time of the division of the eggs, when they were either shipped or set aside for the reserve, aggregated 87,091, of which 62,159 are known to have been unimpregnated eggs. From this we may fix

the proportion impregnated at 92.9 per cent. Total losses before division 9$\frac{2}{10}$ per cent,—about the ordinary rate.

The eggs were shipped in the customary method—packed in wet moss, inclosed in dry moss—and sent down to Princeton, 12 miles distant, in the afternoon; thence by stage 28½ miles to Forest Station, the next forenoon; this part of the journey occupying about 5½ hours, during which the cases of eggs were exposed, with little or no protection, to the wintry blasts.

Excellent success attended the transportation, with a single exception. A case containing 32,000 eggs, addressed to Mr. Brackett, at Winchester, Mass., packed in an experimental manner, which proved to be less efficient than our ordinary mode, was partly frozen on the way, and 8,000 eggs lost. The temperature of the air at the time this package started on its 28½-mile ride in the open air was 20 degrees below zero. In 22 other packages (including all save three, which were not reported on), the entire number of dead eggs on unpacking was reported at 1,806, being three-tenths of one per cent., or three in one thousand.

An attempt was made to economize in bulk, and thereby in freight charges, by the use of asbestos felt in place of moss, but it was found that bulk for bulk it was in no wise superior, while at the same time it was far heavier and more costly. The experiments tried in this connection gave results indicating that, considering only the question of bulk, the best material to save from freezing was wet moss; but if the weight and consequent freight charges be taken into account then the best material is dry moss, which is exceedingly light and as efficient as an equal thickness of asbestos felt or building-paper.

The division of the spawn available for shipment, pro rata with the contributions made by the several parties, was as follows:

United States received	311,750
Maine received	64,500
Massachusetts received	107,500
Connecticut received	107,500
New Hampshire received	53,750

The distribution of the share of the United States will be seen in detail by referring to the subjoined schedule of shipments of eggs.

The hatching of spawn retained (215,000) was accomplished with the insignificant loss of 212 eggs, and of the young fish but 1,691 died; 213,097 young fish were planted in Grand Lake, scattered along shore as usual.

The hatching of the transported eggs and the planting of the young fish were in most instances accomplished with less than the usual mortality. A schedule is subjoined showing the details of the planting.

4.—Extracts from diary.

Grand Lake Stream, *August* 3, 1881.—The season has been very rainy here. The lake stands at 3 feet 11 inches on our gauge. The

water still covers our spawning-house floor, and in hatchery No. 2 it is still several inches above the tops of the troughs. Five gates are open and a great volume passing off, yet Munson thinks the water has been rising lately. The total volume of water now flowing in hatchery No. 1 is 28.6 gallons per minute. In hatchery No. 3 [only one aqueduct was then in operation] the volume is 9.6 gallons per minute. Temperatures of water observed to-day: At hatchery No. 1, 46½° F.; at hatchery No. 3, 53½° F. [the water here is open to sun outside the building]; at Grand Lake, at surface, near dam, 72½° F.

Munson says that the fish hatched out this year were by far the best he ever hatched, stronger and more active. All visitors admired them. None of the fry were planted this year below the dam. They were scattered along the shores of the lake as far as Munson's Island. A number, estimated to have been about 2,000, were taken in a can with six or eight gallons of water, and in turning them out a canful would stretch along several rods of shore.

Both Forbes and Munson testify to the abundance of the young of Schoodic salmon below the dam this year. They often followed and seized the hook intended for large fish. The fishing at the regular season (May and June) this year was excellent. Munson says they took very fine fish and a good many of them, and the fishermen were well satisfied.

September 10, 1881.—Arrived from Bucksport on 9th via Big Lake. The lakes are high, but I hardly think Grand Lake is any higher than in 1875, when, I remember, we used to run canoes down through the sluice-gate of the dam without touching. It stands now on our gauge at 3 feet 5½ inches, with a very light northerly wind. This, it appears, is 5½ inches lower than on August 3. It is now 1 inch below our spawning-house floor. It is 1 foot 7¼ inches higher than November 7, 1880. For about ten days in August the gates were all closed on account of the bursting of the Union dam in Calais. The rest of the time there have been five gates open. The water is believed to be now falling rapidly. In Big Lake the water is very high, there being but two gates open at Princeton.

None of our nets have been put into the water yet, it appearing to Mr. Munson to be unnecessary, because the fish have not come until within a few days. None were caught until Mr. Ferguson's arrival, on the 9th, when he took one. Crossing the bridge on the 9th I saw five of the salmon under the bark-mill. Mr. Ferguson also took two to-day, one just below the dam and one at Big Falls. I have seen several leap above the dam.

October 6.—Third visit to Grand Lake Stream. The nets to intercept the fish in their descent have been in place since the middle of September. Work on the extension and the foundation of hatchery No. 3 is going rapidly forward.

October 26.—Arrived from Bucksport about 11 a. m. The addition to

hatchery No. 3 is nearly finished; cement floors all hard. The stream house (hatchery No. 2) has been put in order for eggs.

October 29.—We put in some of the pound nets to-day. Fish are beginning to spawn above our nets.

October 31.—To-day we put in the second pound, and are now prepared to capture fish.

November 1.—A good many fish ran into pound 2, and were driven through into the large pound. Munson estimates them at 175 at 9 p. m.—say 30 more in the morning. About 40 fish driven in this evening. Very few salmon have got past our nets into either canal or stream.

November 2.—A pretty good run of fish this morning. Munson found in the pound what he called a female sea salmon of 12 pounds weight (afterwards found to be 36 inches long, and probably heavier than this estimate). At 10 a. m. I saw a male sea salmon also within our inclosures.

November 5.—There were good runs of fish on nights of November 2 and 3. Last night about 15 salmon came in before 9 o'clock, and during the remainder of the night a very large school. Yesterday and the day before were rainy, and it cleared at 7 last evening.

November 7.—A good run of fish every night; last two nights less than a hundred each, we judge.

November 8.—To-day we begin the taking of spawn. All the fish captured prior to this date are gathered in a single large inclosure. From this stock we to-day manipulated 591 Schoodic salmon, 210 being males, 192 unripe females, 166 ripe females, and 13 spent females. The predominance of females at so early a date indicates that the majority of the salmon we shall catch have already entered our inclosures. It is usual to take a larger number of males until the season is well advanced, the later catches being mostly of females. The large number of unripe females taken indicates that the delay in beginning manipulation was judicious. Thirty of the females spawned (= 18 per cent) yielded some defective eggs, commonly but very few each. This includes only such eggs as bore some visual sign of imperfection. In most cases they were chalky-white in color; in some there were only small white spots. In others there was the color and transparency of good eggs, but the yelks were collapsed and rolled together. This phenomenon has always been present with the Schoodic salmon, but no exact record made of the matter before. Besides the Schoodic salmon we handled to-day 2 sea salmon and 11 small togue (*Salmo (Cristivomer) namaycush*). The sea salmon were 1 female 36 inches long, gravid, and 1 male 31½ inches long. The togue ranged in length from 17 to 21 inches, being, apparently, all spent fish. The eggs taken to-day (235,000) are placed in hatchery No. 1.

November 11.—Spawning proceeds daily. There are more togue than usual, among the salmon; 22 of them were found to-day, all small. One salmon found to-day whose sex could not be distinguished. It measured 16 inches in length.

November 13.—First snow of the season last night—a mere trace. The temperature of the lake has fallen since November 4 from 49 to 41. Spawning still continues. No large runs of salmon; on night of 11th and 12th only 25 in all. Yesterday we began to put eggs into the stream house, hatchery No. 2.

November 14.—Two nights have brought in but 50 salmon. It appears that the season is drawing to a close.

November 19.—The last day of spawning. We had but 27 gravid females on hand this morning. Twenty of them yielded spawn, and they, with the 7 remaining unripe, were placed in the final inclosure, whence they are to be taken up the lake and liberated. The work of transportation begins to-day.

November 21.—The transportation of fish concluded to-day, and part of the inclosures taken from the water. The main nets are left in place for some days, to prevent the fish that have been turned loose descending the canal and stream, which many of them (perhaps 20 per cent.) attempt to do immediately after they are set free, notwithstanding they are freed one or two miles up the lake. Two inches of snow on the night of 19th. All the eggs deposited in hatchery No. 1 are transferred to No. 3, the latter, with No. 2, having ample accommodations for them.

November 22.—Returned to Bucksport, leaving everything in charge of Mr. Munson.

January 11, 1882.—Arrived from Bucksport at 8.20 p. m.

January 12.—To-day I find at hatchery No. 3 that the west aqueduct is delivering 20 gallons of water per minute, and the south aqueduct 10 gallons. Munson says the volume has been about the same all the winter, except immediately after heavy rains, when it was greater. We have now 485,000 eggs in the new hatchery, and 200,000 additional will be immediately brought up from the river house to hasten their development, so that they may be ready for shipment before March. Munson thinks the rate of impregnation is better than usual this year. We took a tray of lot 1 (earliest eggs), picked out 110 contiguous eggs, and found only 5 of them unimpregnated.

January 13.—Transferred 200,000 eggs from No. 2 to No. 3. These have been in very cold water, averaging a little less than 34° since they were put in the troughs in November, and their eyes are not yet formed.

January 17.—This p. m. Munson picked the unfertilized from six stacks of eggs (120,000 nearly) in two hours forty-seven minutes. He took out 6,700 white eggs, being at the rate of 40¼ eggs per minute, no allowance being made for moving stacks back and forth, shifting trays, &c. Such speedy work can only be accomplished by a practiced hand. The unfertilized have been induced to turn white by previous agitation. To attempt to remove them while retaining their natural color would be tedious and uncertain.

January 18.—To-day we began shipment of spawn, sending 60,000 to E. A. Brackett, Winchester, Mass., and 50,000 to H. J. Fenton, Windsor,

Conn. The outer packing of both cases was dry moss. While packing I observed that not all of the unimpregnated eggs had been removed, and there were some impregnated that were not healthy, small embryos and irregular development. I saw three or four bursted eggs. Now I cannot think that these defects are owing to any fault in our management. The inside moss in part of our boxes was rather drier than ordinary, and I think that all or most of these went to Fenton. (Both packages arrived at their destinations in good order. Mr. Brackett reported condition "excellent." Mr. Fenton said, "good, except some indented." Dead on unpacking in latter lot, 47; subsequent losses, light.)

January 23.—Shipped another lot of eggs (32,000) to Mr. Brackett. I had a case made on purpose for it, intending to have a space of 2 inches all around for outside packing, but by mistake it was made so shoal as to leave but 1¼ inch above and below. I lined it with two thicknesses of asbestos roofing felt on all sides and packed the remaining space with the ordinary dry moss. The case is of half inch pine. The felt used was about 3½ pounds. (Without laps there would have been needed only 2½ pounds.) It costs in Boston 20 cents per pound—here, about 22 cents. It weighs about 1 pound per square yard, and its cost can be put at 2½ cents per square foot. The package weighed, in detail, as follows:

	Lbs.	Oz.
3 boxes eggs packed in wet moss	40	9
Cover, side cleats, and nails	1	7
Total of inner package	42	0
Moss	6	9
Asbestos felt	3	8
Case	20	4
Total of envelope	30	5
Total of entire package	72	5

A package with a protecting envelope of dry moss one inch thicker than the above on all sides would weigh about 3 pounds 14 ounces more. Supposing the two modes equally efficient in protecting against cold, we save near 4 pounds weight, and corresponding amount on freight by an outlay of 77 cents for asbestos and the trouble of lining the cases with it. I believe this will hardly pay. [Subsequent experiments showed that not even the above economy of space would be effected by the use of asbestos felt, its resistance to the escape of heat being not much, if any, greater than that of an equal thickness of moss alone.] Temperature of air at 7 a. m., 0° F. It has been below zero on six mornings this month previous to this date, and once in December.

January 25.—Cold weather has shrunk the volume of water at the hatchery from 30 to 20 gallons within two weeks.

January 27.—This morning we had a smart rain for several hours; yesterday a thaw. No material change in the volume of water in the hatching-house. Grand Lake is rising; the water is just beginning to flow on our spawning-house floor.

January 28.—Mr. Brackett writes that the case of eggs sent him on 23d arrived at Winchester, Mass., on evening of 25th, and on unpacking next morning were found to be "frozen through and through, with the possible exception of a small space in the center." [But this proved to be an exaggerated statement, the actual loss being 8,000 eggs out of 32,000.] These eggs went down to Princeton on stage on 23d. Next morning, with the temperature of the air at 20° F. below zero, and a high wind, they went to Forest on the stage, a drive of five and one-half hours, thence to Boston by rail in a car warmed by a stove. Doubtless the freezing was accomplished before the package reached the railroad. This was the first instance of the kind that has occurred since this establishment was organized. Probably the protecting power of asbestos felt is less than I supposed.

February 2, 1882.—*Experiment with packing materials.*—Last night I took a box made out of an old packing-tray, 12 inches long, 9 wide, and 3¼ deep; ends one-half inch thick; top and bottom about one-fourth of an inch; all pine, joints open, construction loose. On the bottom I put 4 thicknesses of asbestos felt, then a board one-fourth of an inch thick; then I filled it with wet moss, just such as we use in packing eggs, and pressed it in hard with my hands; then put on another quarter-inch board, and finally the cover. This was put together in our shop, temperature 50° or 60° F. The moss was from the moss storeroom, the temperature of which is from 35° to 40° F. About 9 p. m. this box was put out of doors on our shop platform, stood on end, and there allowed to remain till 7 a. m. I then took it in and opened it. The out-door temperature at 6 p. m. was +8° F; at 7 a. m. it was +18° F. On opening the box I found the moss frozen nine thirty-seconds of an inch on the bottom (the felted side). On the top (the board side) twelve thirty-seconds of an inch, on the side without either board or felt, three-fourths of an inch. Reckoning from the inside of the cover, the penetration of the frost was, through felt and board and moss, about twenty-five thirty-seconds of an inch; through board and moss, twenty thirty-seconds of an inch; through moss alone, on narrow side, twenty-four thirty-seconds of an inch; in the latter case had the side been broader I think the frost would not have penetrated so far.

[Other experiments with packing materials were tried February 4, and the results may be stated with tolerable accuracy, thus: Asbestos felt and common building paper vary very little in conducting power, frost penetrating through five-eighths of an inch of either material, and further into wet moss, .25 to .35 inch in case of the asbestos envelope,

and .31 to .37 inch in case of the paper envelope. Dry moss is about the same as asbestos and paper, the frost penetrating through the asbestos 1.60 inch, and through dry moss, under the same circumstances, 1.62 inch. Through wet moss the frost penetrated only from .7 to .9 inch under same circumstances, showing that the latter material is more effective, bulk for bulk, than either dry moss, dry paper, or dry asbestos felt. This agrees with the results of other experiments I have tried with wet moss, yet I think the weight of the latter will forbid its employment in ordinary cases. The paper and asbestos are excluded by their cost and also by their weight. The relative weights of the several substances are about as follows: Asbestos felt, 82; paper, 50; wet moss, 20; dry moss, 3. The comparative weights of the asbestos and paper are given exactly. Those of wet and dry moss are correct relatively to each other, but possibly a little too low relatively to the other substances. But evidently none of the other substances can rival dry moss for our purpose, when efficiency and economy are both considered.]

February 13.—The shipment of eggs, suspended since January 24, is resumed to-day.

February 22.—As in former years we measure our eggs for shipment in old corn cans, each one holding about 2,500. On 13th instant Mr. Munson found that, filled as usual, a measure counted out 2, 720 eggs; twice since then he has counted a measure full and found in one case 2,710, and in another 2,725. The record of shipments before 13th is corrected accordingly, and since that date the measures have been filled not quite so full, with intention to have 2,500 in each as near as possible.

February 23.—To-day I examined the most forward eggs in the river house (No. 2): The eyes have not yet begun to color. To try their hardiness for packing, I took a tray of them and rapped it smartly six or eight times on the table, making the eggs rebound into the air.

February 25.—There were picked from the above tray 94 white eggs and all were unimpregnated. So I should dare to pack these eggs now.

March 1.—Shipment of eggs concluded to-day; 645,000 have been sent away, and 215,000 remain to be hatched and planted in Grand Lake.

March 3.—I return to Bucksport, leaving Mr. Munson in charge.

5.—NOTES FROM MR. MUNSON'S RECORD BOOK.

February 28.—The earliest eggs received from the Penobscot station commence to hatch to-day. [Two hundred and sixty-seven thousand eggs of Penobscot salmon were hatched here at the charge of Mr. Frank Todd, of Milltown, N. B., the same being furnished free by the State of Maine, to be planted in the Saint Croix, the boundary river between Maine and New Brunswick. For the hatching and expenses Mr. Todd paid the establishment $91.26. The eggs were received in three lots, January 30, February 12, and March 11.—C. G. A.]

March 14.—First lot of Schoodic eggs begin to hatch [taken Nov. 8th, and kept meanwhile in hatcheries Nos. 1 and 3, water ranging from 48° to 34½° F. and averaging 39°.1 F. The time occupied has been 126 days to the commencement of hatching.]

March 16.—Lot 1 all hatched.

March 21.—Lot 4 [taken November 11] begins to hatch.

March 23.—Lot 4 all hatched.

March 25.—Moved all eggs from hatchery No. 2 to No. 3.

March 28.—Penobscot eggs received February 12, begin to hatch.

March 30.—Gates all shut down.

March 31.—Penobscot eggs received February 12, all hatched.

April 18.—Penobscot eggs received March 11, begin to hatch.

April 21.—Same all hatched.

May 7.—Lot 6 of Schoodic eggs begin to hatch. [These were taken November 14, and have been since then until March 25 in the cold water of the stream, averaging 34° F., and from that date to the present in spring and snow water averaging 37° F. The general average of temperature has been 34.7° F., and the total time to the commencement of hatching has been 174 days. One more day, 175 days from the beginning, will be the average time of the hatching of this lot of eggs.]

To-day, May 7. The ice broke up in Big Lake.

May 9.—Eggs taken November 14 are all hatched.

May 10.—Ice broke up in Grand Lake.

May 11.—Lot 7, Schoodic eggs, begin to hatch [taken November 16].

May 14.—Lot 7 all hatched. Lot 8 [taken November 18], begins to hatch.

May 15.—Lot 8 all out; lot 9 [taken November 19] begins to hatch.

May 17.—Lots 9 and 10 all hatched. These are the last eggs.

May 22.—Lots 1 and 4 turned out. Also the earliest of the Penobscot fry.

May 26.—Second lot of Penobscot fish turned out.

May. 30.—The last of the Penobscot fish turned out. [In number, 266,240; there having been a loss of 760.]

June 15.—Three men took 84 Schoodic salmon with fly to-day: wind southwest, strong.

June 26.—The last Schoodic salmon turned out.

June 28.—Closed up.

TABLE I.—*Spawning operations at Grand Lake Stream, Maine, November,* 1881.

Date.	Fish at first handling.*							Females spawned.			Eggs taken.	
	Total.	Males.	Females.				Sex unknown.	First time.	Second time.	Females yielding defective eggs.†	Weight.	Number.‡
			Unripe.	Ripe.	Spent.	Total.						
1881.											*Lbs. oz.*	
Nov. 8	609	238	192	166	13	371	.....	166	.....	30	86 15	235,000
9	94	44	21	20	.....	50	.....	29	.....	3	12 11	40,000
10	123	48	28	46	1	75	.....	61	.....	(†)	37 4	110,000
11	109	32	36	40	.....	76	1	51	254	9	47 2	130,000
12	33	12	6	15	.....	21	.....	101	49	10	44 12	116,000
14	50	17	16	15	2	33	.....	105	101	10	59 8	150,000
16	18	2	10	5	1	16	.....	52	105	16	37 13	90,000
18	15	5	2	6	2	10	.....	86	45	11	19 12	47,000
19	.....	.....	.....	.....	.....	.....	.....	20	37	6	11 9	29,000
	1,051	398	311	322	19	652	1	621	601	95	357 6	947,000

*In these columns each fish is recorded when it first comes to hand, and the footings show the total catch.

† In most cases the defective eggs were few in number, sometimes but 1, 2, or 3. Doubtless there were some with defective eggs that the workmen neglected to report, and probably the blank on the 10th is in consequence of some such omission.

‡ These figures are obtained by adding the number rejected at the daily pickings to the number measured out at the time of dividing the eggs in winter.

TABLE II.—*Transfer of Schoodic salmon eggs from Grand Lake Stream, Maine, in* 1882.

Date.	Consignee.	Address.	Final destination.	No. of cases.	Weight.	Number of eggs.			Miles transported.	Hours en route.	Condition on unpacking.	Dead on unpacking.
						Belonging to States.	Belonging to United States.	Total.				
1882.					*Pounds.*							
Jan. 18	E. A. Brackett	Winchester, Mass	Winchester, Mass	1	(†) 150	65,000	.....	.....	389	70	Excellent	*350
18	H. J. Fenton	Windsor, Conn	Poquonock, Conn	1	(†) 150	53,750	250	54,000	502	73	Good, except some indented.	47
23	E. A. Brackett	Winchester, Mass	Winchester, Mass	1	72	32,000	.....	32,000	389	70	Partly frozen	8,000
24	A. H. Powers	Plymouth, N. H	Plymouth, N. H	1	120	54,000	.....	54,000	508	70	Good	73
24	H. J. Fenton	Windsor, Conn	Poquonock, Conn	1	93	43,000	.....	43,000	502	73	Good	11
Feb. 13	Mrs. J. H. Slack	Bloomsbury, N. J	Bloomsbury, N. J	1	75	.....	22,000	22,000	683	104	"Good, but much indented; a few hatched, and some bursting sack."	106
13	Seth Green	Mumford, N. Y	Mumford, N. Y	1	45	.....	11,000	11,000	840	102	"Splendid"	23
13	T. B. Ferguson	Baltimore, Md	Baltimore, Md	1	50	.....	11,000	11,000	805	120	"Good, but too far advanced."	25
13	Seth Weeks	Corry, Pa	Corry, Pa	1	48	.....	11,000	11,000	972	122	"Good"	85
14	J. M. Haven	Rutland, Vt	Rutland, Vt	1	45	.....	10,000	10,000	525	64	"Good"	3
14	E. G. Blackford	New York	Roslyn, N. Y	1	45	.....	10,000	10,000	640	.....	Good	.....
14	C. H. Brownell	Saint Joseph, Mo	Saint Joseph, Mo	1	85	.....	25,000	25,000	1,847	120	"Very superior"	47
15	B. F. Shaw	Anamosa, Iowa	Anamosa, Iowa	1	81	.....	25,000	25,000	1,607	168	"Good"	147
15	M. T. Bailey	Madison, Wis	Madison, Wis	1	84	.....	25,000	25,000	1,536	120	Good	191
16	R. O. Sweeny	Saint Paul, Minn	Saint Paul, Minn	1	81	.....	25,000	25,000	1,789	192	"Good"	167
16	J. G. Portman	Paris, Mich	Paris, Mich	1	81	.....	25,000	25,000	1,431	156	"Good"	304
24	F. Mather	Newark, N. J	Germany	1	63	.....	20,000	20,000	3,840	.....	Good	.....
27	E. A. Brackett	Winchester, Mass	Winchester, Mass	1	52	10,500	5,000	15,500	389	72	"Excellent"	10
27	H. J. Fenton	Windsor, Conn	Poquonock, Conn	1	53	10,500	5,000	15,500	502	74	"Good"	11
27	B. B. Redding	San Francisco, Cal	San Francisco, Cal	1	51	.....	10,000	10,000	3,818	270	"Good"	100
27	A. H. Powers	Plymouth, N. H	Plymouth, N. H	1	30	.....	4,750	4,750	503	72	"A No. 1"	0
27	E. M. Russell	Paris, Tenn	Paris, Tenn	1	30	.....	5,000	5,000	1,660	144	"Excellent"	20
28	F. N. Clark	Northville, Mich	Northville, Mich	1	150	.....	56,750	56,750	1,158	98	"Best lot of salmon eggs I ever received."	44
28	O. A. Dennen	Mount Kineo, Me	Mount Kineo, Me	1	(†) 80	23,000	.....	23,000	232	190	"Good"	20
Mar. 1	F. C. Hewey	Rangely, Me	Rangely, Me	1	(†) 80	23,000	.....	23,000	300	72	"Very good"	10
1	A. J. Darling	Enfield, Me	Enfield, Me	1	(†) 80	18,500	5,000	23,500	103	50	"Good"	12
			Total	26	1,973	333,250	311,750	645,000				9,806

*Including those that died for several days after unpacking.

TABLE III.—*Planting of Schoodic salmon reared from eggs gathered in* 1881.

State.	Where hatched.	Waters in which the fry were placed.	Tributary to what other water.	Locality of deposit.	Date of transfer.	No. of fish.
					1882.	
California	San Leandro	Prosser Creek	Truckee River	Near Boca, Nevada County	Apr. 7	1,986
		Blue Lakes		Lake County	Apr. 13	2,447
		Lake Honda		San Francisco County	Apr. 7	1,000
Connecticut	Poquonock	Shaker Pond	Connecticut River	Enfield		5,000
		Housatonic River		New Milford		5,000
		Twin Lakes	Housatonic	Salisbury		10,000
		Wanousconous Lake	Housatonic River	Lakeville		10,000
		Square Pond	Connecticut River	Ellington		10,000
		....do	Willimantic	Stafford		10,000
		Canterbury Pond	Quinnebaug River	Plainfield		10,000
		Bantam Lake	Connecticut River	Moodus		10,000
		Ball's Pond	Housatonic River	New Fairfield		10,000
		Bride Pond		East Lyme		11,449
		Snipsic Lake	Connecticut River	Rockville		10,000
Indiana	Northville, Mich	Lake		Laporte	May 15	1,000
Iowa	Anamosa	Clear Lake	Shell Rock and Cedar River	Clear Lake, Cerro Gordo County		7,500
		Okiboji Lake	Little Sioux River	Spirit Lake, Dickinson County		7,500
Maine	Enfield	Cold Pond	Penobscot River	Enfield		10,000
	Grand Lake Stream	Grand Lake	Schoodic River	Hinkley, Washington County	May 22 to June 26	213,097
	Mount Kineo	Moosehead Lake	Kennebec River	Piscataquis County	June —	21,000
	Rangely	South Bog Stream	Rangely Lake	Franklin County	June 15	5,000
		Kennebago Stream	Moosehcmaguntic Lake	....do	June 15	4,560
		Rangely Stream	....do	....do	June 15	5,000
		Bemis Stream	....do	....do	June 15	3,000
		Androscoggin River	Richardson Lake	Oxford County	June 15	5,000
Maryland	Baltimore	Deer Creek	Susquehanna River	Harford County	Apr. 22	9,474
Massachusetts	Winchester			Stockbridge		14,030
				Worcester		14,000
				Falmouth		21,000
				Great Barrington		14,000
				Northampton		14,000
				Wayland		7,000
				Scituate		7,000
				Harvard		11,000
Michigan	Northville	Long Lake		Mecosta County	Apr. 27	6,000
		Higgins' Lake		Roscommon County	Apr. 28	3,000
		Chippewa Lake		Lake County	Apr. 27	6,000
		Goguac Lake		Battle Creek, Calhoun County	May 1	3,000
		Union Lake		Pontiac, Oakland County	May 15	8,000
Minnesota	Saint Paul	White Bear Lake		Ramsey, Washington County	May 16	2,000
		Lake Minnetonka		Hampshire County	May 17	2,000
		Cedar Lake		Rice County	May 18	2 000

Minnesota	Saint Paul	Lakes		Fillmore and Olmstead Counties	May 19	2,000
		Streams		Winona County	June 16	5,000
Missouri	Saint Joseph	Contrary Lake		Buchanan County	Feb. 19	12,500
		Bean Lake		do	Feb. 19	5,000
		Sugar Lake		do	Feb. 19	5,000
New Hampshire	Plymouth	Pleasant Pond		Francestown, Hillsborough County	May 24	4,000
		Three Ponds		Milton, Strafford County	May 27	5,000
		Sunapee Lake		Newbury, Merrimack County	May 27	5,000
		Star Pond		Springfield, Sullivan County	May 27	5,000
		Newfound Lake		Hebron, Grafton County	May 30	12,000
		Long Pond		Hancock, Hillsborough County	May 31	5,000
		Mount William Pond		Weare, Hillsborough County	May 31	2,500
		Squam Lake		Holderness, Grafton County	May 31	12,000
		North Pond		Sandwich, Carroll County	May 31	5,000
New Jersey	Bloomsbury	Greenwood Lake		Cooper	May 1	5,000
		Strubel Lake		Sussex County	May 3	16,274
New York	Roslyn	Waters of South Side Sportsmen's Club				5,350
		Skaneateles Lake		Onondaga County		5,350
	Caledonia	Caledonia Creek		Mumford, Monroe County		(?)10,000
Ohio	Northville, Mich	Waterworks reservoir		Piqua	May 3	6,000
Pennsylvania	Corry	A small lake	Delaware River	Near Hawley and Carbondale		9,133
Tennessee	Paris	Private pond		Paris		3,500
Vermont	Rutland	Shrewsbury Pond		Near Rutland		9,900

XXV.—STATISTICS OF THE SHAD-HATCHING OPERATIONS CONDUCTED BY THE UNITED STATES FISH COMMISSION IN 1881.

By Chas. W. Smiley.

From the reports of the various persons in charge of shad-hatching stations during the spring of 1881, and from the reports of messengers in charge of shipments, I have prepared a series of six tables to show the operations at each station, and the seventh for a summary exhibit. From these it will appear that 87,441,000 eggs were obtained and hatched with an average loss of 20 per cent. A comparison with the number of shad hatched in previous years is of interest, and the constant increase gratifying.

Number of shad hatched:

1879	16,842,000
1880	29,473,000
1881	70,035,000
1872–1881 inclusive	172,423,350

Of the fish hatched, a part were deposited in waters near the several hatching stations, as follows:

Deposited in local waters:

1879	5,587,000
1880	7,864,600
1881	46,518,500

Of the fish hatched, the number transported to other waters was as follows:

Transported to other waters:

1879	10,002,500
1880	20,761,400
1881	23,516,500

The number of shad deposited within the waters of the different States the present year was as follows:

Connecticut	1,000,000
Delaware	940,000
District of Columbia	205,000
Georgia	1,800,000
Iowa	1,100,000

Kansas	200,000
Kentucky	707,000
Maine	1,150,000
Maryland	24,705,000
North Carolina	4,357,500
Ohio	1,020,000
Pennsylvania	3,500,000
Rhode Island	500,800
South Carolina	620,000
Tennessee	400,000
Texas	277,000
Virginia	24,280,000
West Virginia	175,000
Total	67,002,500

Fuller particulars of these deposits, the time, streams, places, &c., will be found in the tables of distribution—Tables VIII and IX.

For comparison with the number of shad sent to the various States in the years 1872–'80, see summary tables published in another part of this volume.

TABLE I.—*Record of shad-hatching operations conducted by United States steamer Fish Hawk, Lieut. Z. L. Tanner, commanding, at Capehart's Wharf, in Salmon Creek, Avoca, N. C., from April 12 to April 30, 1881.*

Date.	Ripe shad taken.		Eggs obtained.	Eggs lost.	Fish released in local waters.	Transported to other waters.
	Males.	Females.				
April 12	3	3	66,000	66,000	.....	.....
13	2	2	66,000	.....	.....	.....
14	4	4	117,000	.....	.....	.....
15	1	1	34,000	.....	.....	.....
19	9	8	132,000	.....	.....	.....
20	3	3	107,000	.....	.....	.....
21	11	11	332,000	.....	.....	.....
22	21	21	649,000	149,000	.....	.....
23	18	18	489,000	83,000	.....	.....
25	28	28	929,000	41,500	.....	.....
26	34	32	979,000	52,000	.....	.....
27	32	30	931,000	16,000	.....	.....
28	11	10	298,000	41,000	.....	.....
29	13	13	432,000	34,000	498,000	.....
30	5	5	166,000	8,000	830,000	*3,029,500
May 1	.....	.....	.....	500,000	.....	.....
2	.....	.....	.....	379,000	.....	.....
Total	195	189	5,727,000	1,369,500	1,328,000	3,029,500

*Captain Tanner states that these eggs were transferred to North Carolina Fish Commission at various times.

TABLE II.—*Record of shad-hatching operations conducted by M. McDonald, at Gunston and other places on the Potomac River, under the direction of the United States Fish Commission, from April 20 to May 30 inclusive, 1881.**

Date.	Length in fathoms of haul seines.	Shad taken.	Ripe females.	Eggs obtained.	Eggs lost.	Fish released in local waters.	Fish transported to other waters.	Where released in local waters.†
1881.								
April 20	5,000	3,534	4	125,000	.....	.....	.....	
21	5,000	2,479	1	25,000	.....	.....	.....	
22	5,000	2,801	5	150,000	.....	.....	.....	
23	5,000	3,597	.....	235,000	.....	.....	.....	
25	5,000	4,616	30	910,000	.....	.....	.....	
26	5,000	4,567	28	830,000	.....	.....	.....	
27	5,000	4,783	11	325,000	151,000	234,000	.....	Pomonkey, Md.
28	5,300	3,997	31	930,000	.....	.....	.....	
29	5,300	4,938	21	610,000	97,000	.....	.....	
30	5,300	5,046	20	570,000	.....	1,383,000	.....	Gunston, Va.
May 1	5,300	3,761	15	400,000	25,000	.....	.....	
2	5,000	2,635	20	510,000	175,000	625,000	.....	Gunston, Va.
3	6,650	7,067	50	1,420,000	.....	1,510,000	.....	Do.
4	6,650	5,178	90	2,320,000	.....	.....	.....	
5	6,650	5,678	90	2,225,000	50,000	.....	.....	
6	6,350	4,682	50	1,530,000	310,000	1,130,000	.....	Gunston, Va.
7	6,350	5,101	101	3,090,000	300,000	230,000	.....	Do.
8	.....	.....	.....	.....	133,000	.....	.....	
9	6,350	4,951	51	1,565,000	101,000	2,887,000	.....	Gunston, Va.
10	6,350	4,698	17	500,000	100,000	1,834,000	.....	Do.
11	6,350	2,977	41	1,220,000	119,000	1,730,000	.....	Do.
12	6,350	1,907	36	1,060,000	10,000	2,576,000	250,000	Do.
13	6,350	2,909	21	620,000	650,000	40,000	250,000	Do.
14	6,350	3,191	4	100,000	.....	.....	350,000	
15	6,350	2,059	17	510,000	330,000	.....	.....	
16	6,350	2,357	46	1,360,000	.....	2,585,000	.....	Gunston, Va.
17	3,650	2,840	63	1,880,000	.....	.....	.....	
18	3,650	1,835	162	4,870,000	.....	.....	.....	
19	3,650	1,797	27	800,000	1,520,000	.....	.....	
20	3,650	1,937	77	2,290,000	.....	1,125,000	.....	Gunston, Va.
21	3,650	1,656	30	900,000	.....	.....	1,000,000	
22	4,850	.....	.....	.....	.....	.....	800,000	
23	3,650	1,481	17	500,000	545,000	.....	1,100,000	
24	3,650	1,544	107	3,215,000	.....	5,490,000	300,000	Gunston, Va.
25	3,650	1,046	54	1,620,000	350,000	.....	.....	
26	2,350	1,481	4	120,000	.....	140,000	1,000,000	Gunston, Va.
27	850	1,554	43	1,290,000	200,000	.....	1,000,000	
28	850	1,397	74	2,200,000	250,000	1,905,000	.....	Fort Washington, Md.
29	850	826	12	375,000	.....	.....	.....	
30	550	1,144	.....	.....	870,000	1,096,000	400,000	Fort Washington, Md.
30	.....	.....	.....	.....	‡1,619,000	.....	.....	
Total ...	184,150	120,047	1,470	§43,200,000	7,905,000	26,515,000	5,950,000	

* For a more detailed statement of this work see report of M. McDonald.

† For details of deposits of fish see tables of distribution.

‡ 220,000 of these eggs were used in experiments; the rest are unaccounted for; probably a loss

§ Of this amount 2,630,000 eggs were sent to navy-yard station.

TABLE III.—*Record of shad-hatching operations conducted by Frank L. Donnelly, at Navy-Yard Station, Potomac River, under the direction of the United States Fish Commission, from May 4 to June 2, 1881.*

Date.	Eggs obtained.	Eggs lost.	Fish released in local waters.	Fish transported to other waters.	Messenger in charge of transfer.*
1881.					
May 4	200,000	10,000	.....	.....	
5	200,000	5,000	.....	.....	
6	270,000	5,000	.....	.....	
7	370,000	10,000	.....	.....	
9	430,000	20,000	.....	.....	
10	300,000	10,000	105,000	85,000	J. Frank Ellis.
11	230,000	10,000	.....	.....	
12	65,000	5,000	.....	460,000	G. G. Davenport.
13	100,000	10,000	100,000	260,000	Do.
15	.....	.....	.....	410,000	N. Simmons and C. W. Schuermann.
16	35,000	2,000	.....	290,000	C. A. Stewart and C. W. Schuermann.
17	70,000	3,000	.....	.....	
18	180,000	10,000	.....	.....	
19	300,000	20,000	.....	220,000	H. E. Quinn.
20	865,000	65,000	.....	150,000	C. W. Schuermann.
21	450,000	.....	.....	.....	
22	.....	.....	.....	100,000	C. W. Schuermann.
23	375,000	.....	.....	.....	
24	500,000	.....	.....	.....	
25	†1,600,000	.....	.....	170,000	N. Simmons.
26	.....	.....	.....	280,000	N. Simmons and C. A. Stewart.
27	†720,000	.....	.....	500,000	Geo. H. H. Moore.
28	†120,000	.....	.....	.....	
29	.....	.....	.....	.....	
30	†355,000	‡3,465,000	.....	.....	
June 2	.....	200,000	.....	150,000	W. H. Jenkins, jr.
Total ...	§7,730,000	3,850,000	205,000	3,075,000	

* For final destination of these fish, see tables of distribution.
† Of these eggs, 2,630,000 were received from Potomac barges.
‡ Eggs unaccounted for; probably lost.
§ Of this number, 600,000 were reported turned over to M. McDonald on his assuming charge of the Navy-Yard Station.

TABLE IV.—*Record of shad-hatching operations conducted by Frank N. Clark, at Havre de Grace, Md., on the Susquehanna River, under the direction of the United States Fish Commission; from May 15 to June 13, inclusive,* 1881.

Date.	Eggs obtained.	Eggs lost.	Fish hatched.	Fish released in local waters.	Fish transported to other waters.	Messenger in charge of transfer.*
1881.						
May 15†	6,625,000	504,000	4,101,000	4,101,000	.....	
16	275,000	64,000	1,566,000	566,000	1,000,000	J. P. Creveling.
17	375,000	5,000	100,000	100,000	.....	
18	135,000	.....	.....	.....	.....	
19	105,000	.....	.....	.....	.....	
20	150,000	25,000	260,000	260,000	.....	
21	210,000	.....	.....	.....	.....	
22	400,000	.....	.....	.....	.....	
23	900,000	.....	.....	.....	.....	
24	1,410,000	.....	.....	.....	.....	
25	705,000	92,000	1,048,000	48,000	1,000,000	J. P. Creveling.
26	750,000	30,000	330,000	330,000	.....	
27	765,000	40,000	365,000	365,000	.....	
28	450,000	290,000	825,000	825,000	.....	
29	325,000	75,000	1,900,000	400,000	1,500,000	J. P. Creveling.
30	250,000	.....	675,000	.....	.....	
31	.....	110,000	925,000	400,000	900,000	C. W. Schuermann.
June 1	50,000	75,000	100,000	.....	.....	
2	.....	.....	260,000	.....	.....	

* For final destination of these fish, see tables of distribution.
† May 15 includes a number of previous days' operations which cannot be given specifically.

TABLE IV.—*Record of shad-hatching operations, &c.*—Continued.

Date.	Eggs obtained.	Eggs lost.	Fish hatched.	Fish released in local waters.	Fish transported to other waters.	Messenger in charge of transfer.
1881.						
June 3			115,000		775,000	C. W. Schuermann.
4	100,000					
6	300,000	10,000				
7	450,000		50,000			
8	300,000		40,000			
9				90,000		
10		150,000				
11			150,000			
12			450,000			
13			300,000	*900,000		
Total...	15,030,000	1,470,000	13,560,000	8,385,000	5,175,000	

* Remained on hand at close of daily reports; probably deposited in local waters.

TABLE V.—*Record of shad-hatching operations conducted by Marshall McDonald, at Navy-Yard Station, Potomac River, under the direction of the United States Fish Commission, from June 1 to June 25, inclusive, 1881.**

Date.	Length in fathoms of visited—		Shad taken.	Ripe females.	Eggs obtained.	Eggs lost.	Fish transported to other waters.	Messenger in charge of transfer.
	Haul-seines.	Gill-nets.						
June 1					†60,000			
2	550	7,200	471	4	75,000		300,000	W. H. Jenkins, jr.
3	250	7,200	140	2	40,000			
4	250	7,200	205	13	380,000		120,000	F. L. Donnelly.
5	250	7,200	221	6	175,000	150,000		
6	250	7,200	209	10	250,000			
7	250	7,200	153	12	370,000	10,000	100,000	J. F. Ellis.
8	250	7,200	139	4	75,000		200,000	C. J. Huske.
9		7,200				20,000	200,000	H. E. Quinn.
10		7,200						
11		3,200			45,000		200,000	N. Simmons.
12		3,200					150,000	G. G. Davenport.
13		3,200		12	330,000		670,000	Ellis and Moore.
14		3,200		25	450,000			
15		3,200		10	270,000			
16		3,200		7	200,000			
17		3,200		11	290,000	60,000		
18		3,200		6	170,000		400,000	Quinn, Schuermann, and Simmons.
19		3,200		1	10,000		200,000	F. N. Clark.
20								
21		3,200		2	40,000		1,140,000	J. F. Ellis.
22		3,200		2	40,000		120,000	C. A. Stewart.
23		3,200						
24		3,200						
25		3,200			30,000			
Total...	2,050	109,600	1,538	127	3,840,000	240,000	3,800,000	

* For a more detailed statement of this work, see report of M. McDonald.
† Received from Frank L. Donnelly's navy-yard station.

TABLE VI.—*Record of shad-hatching operations conducted by United States steamer Fish Hawk, Lieut. Z. L. Tanner commanding, at Havre de Grace, Md., in the Susquehanna and North East Rivers, from May 5 to June 5, 1881.*

Date.	Ripe shad taken.		Eggs obtained.	Eggs lost.	Fish released in local waters.	Fish transported to other waters.
	Males.	Females.				
May 5	6	6	182,000			
6	17	17	462,000			
8	21	21	506,000			
9	49	47	1,660,000			
10	11	11	341,000			
11	28	28	913,000			
12	30	30	979,000		660,000	
13	8	8	265,000		1,660,000	
14	9	9	348,000		830,000	
15	14	12	357,000		598,000	
16	10	11	357,000		979,000	
17	10	13	424,000			
18	9	8	257,000		498,000	
19	12	14	423,000		166,000	
20	20	25	781,000			
21	53	54	1,792,000			
22	18	19	291,000			
23	17	23	650,000		325,000	
24	14	15	463,000		313,000	
25	28	31	781,000		275,000	
26	40	43	1,062,000		406,000	
27	22	22	625,000		1,250,000	
28	22	25	675,000		500,000	
29	10	10	369,000			
30	2	2	50,000		1,000,000	
31	6	6	106,000			1,250,000
June 1	8	8	187,000			500,000
2	2	2	38,000		625,500	312,000
3	2	2	50,000			125,000
4	2	2	50,000			
5						300,000
Total	500	524	15,444,000	2,871,500	10,085,500	2,487,000

TABLE VII.—*Summary of work at shad-hatching stations operated by the United States Fish Commission during the spring of* 1881.

Dates.		Location of stations.		Person in charge of station.	Eggs obtained.	Eggs lost.	Fish hatched.	Fish released in local waters.	Fish transported to other waters.
Season began.	Season ended.	Water.	Place.						
.....	.....	Albemarle Sound	Avoca, N. C	Z. L. Tanner	5, 727, 000	1, 369, 500	4, 357, 500	1, 328, 000	3, 029, 500
April 20	May 30	Potomac River	Barges	M. McDonald	40, 570, 000	7, 905, 000	32, 665, 000	26, 515, 000	5, 950, 000
May 4	June 2	.....do	Navy-Yard	F. L. Donnelly	7, 130, 000	3, 850, 000	3, 280, 000	205, 000	3, 075, 000
May 15	June 13	Susquehanna River	Havre de Grace, Md	F. N. Clark	15, 030, 000	1, 470, 000	13, 560, 000	8, 385, 000	5, 175, 000
June 1	June 25	Potomac River	Navy-Yard	M. McDonald	3, 840, 000	240, 000	3, 600, 000	.....	3, 800, 000
May 5	June 5	Susquehanna River	Havre de Grace, Md	Z. L. Tanner	15, 444, 000	2, 871, 500	12, 572, 500	10, 085, 500	2, 487, 000
					87, 741, 000	17, 706, 000	*70, 035, 000	46, 518, 500	23, 516, 500

* The tables of distribution show the destination of 67,353,000 of these fish. There were also used for experiments at Armory 180,000, and for Minnesota experiments 40,000. The remaining 2,462,000 either died before delivery to messengers or were deposited without a record being made.

TABLE VIII.—*Chronological record of distribution of young shad made under the direction of the United States Commissioner of Fish and Fisheries, from April 27, 1881, to June 22, 1881.*

Date.	Where fish were hatched.	Number of fish—		Introduction of fish.				Transfer in charge of—
		Started with.	Actually planted.	State.	Town or place.	Stream.	Tributary of—	
April 12–30	Steamer Fish Hawk	*3, 029, 500	3, 029, 500					
29	do	498, 000	498, 000	North Carolina	Avoca	Salmon Creek	Albemarle Sound	Z. L. Tanner.
30	do	830, 000	830, 000	do	do	do	do	Do.
27	Potomac barges	234, 000	234, 000	Maryland	Pomonkey	Potomac River	Chesapeake Bay	M. McDonald.
30	do	1, 383, 000	1, 383, 000	Virginia	Gunston	do	do	Do.
May 2	do	625, 000	625, 000	do	do	do	do	Do.
5	do	1, 510, 000	1, 510, 000	do	do	do	do	Do.
6	do	1, 130, 000	1, 130, 000	do	do	do	do	Do.
7	do	230, 000	230, 000	do	do	do	do	Do.
9	do	2, 887, 000	2, 887, 000	do	do	do	do	Do.
10	do	1, 834, 000	1, 834, 000	do	do	do	do	Do.
10	Navy-yard	85, 000	85, 000	Maryland	Cumberland	do	do	J. F. Ellis.
10	do	105, 000	105, 000	Dist. of Columbia	Washington	do	do	F. L. Donnelly.
11	Potomac barges	1, 730, 000	1, 730, 000	Virginia	Gunston	do	do	M. McDonald.
12	do	2, 571, 000	2, 571, 000	do	do	do	do	Do.
12	Steamer Fish Hawk	660, 000	660, 000	Maryland	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
12	Potomac barges	250, 000	250, 000	do	Weaverton	Potomac River	Chesapeake Bay	N. Simmons.
12	Navy-yard	460, 000	460, 000	do	Laurel	Patuxent River	do	G. G. Davenport.
13	Potomac barges	40, 000	40, 000	Virginia	Gunston	Potomac River	do	M. McDonald.
13	Navy-yard	260, 000	260, 000	Maryland	Laurel	Patuxent River	do	G. G. Davenport.
13	do	100, 000	100, 000	Dist. of Columbia	Washington	Potomac River	do	F. L. Donnelly.
13	Steamer Fish Hawk	1, 660, 000	1, 660, 000	Maryland	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
14	Potomac barges	250, 000	250, 000	do	Point of Rocks	Potomac River	Chesapeake Bay	N. Simmons.
14	do	175, 000	175, 000	do	Relay House	Patapsco River	do	G. G. Davenport.
14	Steamer Fish Hawk	830, 000	830, 000	do	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
15	Potomac barges	175, 000	175, 000	West Virginia	Wheeling	Ohio River	Mississippi River	J. F. Ellis.
15	Navy-yard	300, 000	300, 000	Maryland	Laurel	Patuxent River	Chesapeake Bay	N. Simmons.
15	Steamer Fish Hawk	598, 000	598, 000	do	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
16	Potomac barges	2, 585, 000	2, 585, 000	Virginia	Gunston	Potomac River	Chesapeake Bay	M. McDonald.
16	Havre de Grace	4, 101, 000	4, 101, 000	Maryland	Battery Island	Susquehanna River	do	F. N. Clark.
16	Steamer Fish Hawk	979, 000	979, 000	do	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
17	Havre de Grace	566, 000	566, 000	do	Battery Island	Susquehanna River	Chesapeake Bay	F. N. Clark.
17	Navy-yard	200, 000	200, 000	South Carolina	Charlotte	Catawba River	Wateree River	C. W. Schuermann.
17	Havre de Grace	1, 000, 000	1, 000, 000	Pennsylvania	Sunbury	Susquehanna River	Chesapeake Bay	J. P. Creveling.
18	do	100, 000	100, 000	Maryland	Battery Island	do	do	F. N. Clark.
18	Steamer Fish Hawk	498, 000	498, 000	do	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
18	Navy-yard	200, 000	200, 000	Kentucky	Bowling Green	Barron River	Green River	C. A. Steuart.
19	do	220, 000	170, 000	Ohio	Defiance	Maumee River	Lake Erie	H. E. Quinn.
19	Steamer Fish Hawk	166, 000	166, 000	Maryland	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.

	20	Navy-yard	150,000	150,000	do	Laurel	Patuxent River	Chesapeake Bay	C. W. Schuermann.
	20	Potomac barges	1,125,000	1,250,000	Virginia	Gunston	Potomac River	do	M. McDonald.
	21	Havre de Grace	260,000	260,000	Maryland	Battery Island	Susquehanna River	do	F. N. Clark.
	21	Potomac barges	1,000,000	1,000,000	do	Benedict	Choptank River	do	T. B. Ferguson.
	23	Steamer Fish Hawk	325,000	325,000	do	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
	24	Potomac barges	5,490,000	5,490,000	Virginia	Gunston	Potomac River	Chesapeake Bay	M. McDonald.
	24	Navy-yard	200,000	192,000	Kentucky	High Bridge	Kentucky River	Ohio River	C. A. Steuart.
	24	Steamer Fish Hawk	313,000	313,000	Maryland	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
	25	Potomac barges	1,000,000	1,000,000	Georgia	Macon	Ocmulgee River	Altamaha River	C. W. Schuermann.
	25	Steamer Fish Hawk	275,000	275,000	Maryland	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
	26	Potomac barges	140,000	140,000	Virginia	Gunston	Potomac River	Chesapeake Bay	M. McDonald.
	26	Havre de Grace	1,000,000	1,000,000	Pennsylvania	Mifflin	Juniata River	Susquehanna River	J. P. Creveling.
	26	do	48,000	48,000	Maryland	Battery Island	Susquehanna River	Chesapeake Bay	F. N. Clark.
	26	Steamer Fish Hawk	406,000	406,000	do	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
	27	Havre de Grace	330,000	330,000	do	Battery Island	Susquehanna River	Chesapeake Bay	F. N. Clark.
	27	Navy-yard	500,000	500,000	do	Laurel	Patuxent River	do	Geo. H. H. Moore.
	27	do	200,000	175,000	Kentucky	Shepherdsville	Salt River	Rolling River	C. A. Steuart.
	27	Potomac barges	1,000,000	850,000	Ohio	Steubenville	Ohio River	Mississippi River	N. Simmons.
	27	Steamer Fish Hawk	1,250,000	1,250,000	Maryland	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
	28	Havre de Grace	365,000	365,000	do	Battery Island	Susquehanna River	Chesapeake Bay	F. N. Clark.
	28	Fort Washington	1,905,000	1,905,000	do	Fort Washington	Potomac River	do	M. McDonald.
	28	Steamer Fish Hawk	500,000	500,000	do	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
	29	Havre de Grace	825,000	825,000	do	Battery Island	Susquehanna River	Chesapeake Bay	F. N. Clark.
	30	do	400,000	400,000	do	do	do	do	Do.
	30	do	1,500,000	1,500,000	Pennsylvania	Newport	Juniata River	Susquehanna River	J. P. Creveling.
	30	Fort Washington	1,096,000	1,096,000	Maryland	Fort Washington	Potomac River	Chesapeake Bay	M. McDonald.
	30	Steamer Fish Hawk	1,000,000	1,000,000	do	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
	31	Potomac barges	1,000,000	1,000,000	Virginia	Lynchburg	James River	Chesapeake Bay	J. F. Ellis.
June	1	Havre de Grace	500,000	500,000	Maryland	Battery Island	Susquehanna River	do	F. N. Clark.
	1	do	1,000,000	940,000	Delaware	Seaford	Nanticoke River	do	C. W. Schuermann.
	1	Navy-yard	200,000	200,000	Kentucky	Mumfordsville	Green River	Ohio River	C. A. Steuart.
	1	do	200,000	200,000	Georgia	Crawfordsville	Oconee River	Altamaha River	N. Simmons.
	1	do	220,000	220,000	South Carolina	Railroad Crossing	Pedee River	Atlantic Ocean	H. E. Quinn.
	2	do	150,000	150,000	Maryland	Laurel	Patuxent River	Chesapeake Bay	W. H. Jenkins, jr.
	2	Steamer Fish Hawk	625,500	625,500	do	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
	3	Havre de Grace	1,000,000	1,000,000	Connecticut	Warehouse Point	Connecticut River	Long Island Sound	C. W. Schuermann.
	3	do	500,000	500,000	Rhode Island	Warren	Palmer's River	Narragansett Bay	H. E. Quinn.
	4	Navy-yard	120,000	120,000	Maryland	Weaverton	Potomac River	Chesapeake Bay	F. L. Donnelly.
	7	Havre de Grace	100,000	100,000	do	Battery Island	Susquehanna River	do	F. N. Clark.
	8	Navy-yard	200,000	200,000	South Carolina	Columbia	Congaree River	Santee River	C. J. Huske.
	9	do	200,000	200,000	Georgia	Crawfordsville	Little River	Savannah River	H. E. Quinn.
	9	Havre de Grace	90,000	90,000	Maryland	Battery Island	Susquehanna River	Chesapeake Bay	F. N. Clark.
	13	Navy-yard	100,000	100,000	Georgia	Albany	Flint River	Appalachicola River	N. Simmons.
	13	do	100,000	100,000	do	Montezuma	do	do	F. L. Donnelly.
	14	do	150,000	135,000	Texas	Railroad Crossing	Sabine River	Gulf of Mexico	G. G. Davenport.
	15	do	58,000	56,000	do	Austin	Colorado River	do	G. H. H. Moore.
	15	do	32,000	30,000	do	Railroad Crossing	San Marcus River	do	G. G. Davenport.
	15	do	28,000	26,000	do	do	Brazos River	do	Do.
	15	do	32,000	30,000	do	do	San Antonio River	do	Do.
	15	do	525,000	525,000	Maine	Waterville	Kennebec River	Atlantic Ocean	J. F. Ellis.

*Captain Tanner states that he turned these over to S. G. Worth, superintendent of fisheries of North Carolina.

TABLE VIII.—*Chronological record of distribution of young shad, &c.*—Continued.

Date.		Where fish were hatched.	Number of fish.		Introduction of fish.				Transfer in charge of—
			Started with.	Actually planted.	State.	Town or place.	Stream.	Tributary of—	
June	15	Havre de Grace	625,000	625,000	Maine	Mattawamkeag	Mattawamkeag River	Penobscot River	J. F. Ellis.
	18	Navy-yard	200,000	200,000	Georgia	Milledgeville	Oconee River	Altamaha River	H. E. Quinn.
	20	do	200,000	200,000	Tennessee	Johnsonville	Tennessee River	Ohio River	N. Simmons.
	20	do	200,000	200,000	Kansas	Kansas City	Missouri River	Mississippi River	F. N. Clark.
	24	do	1,140,000	1,106,000	Iowa	Dubuque	Mississippi River	Gulf of Mexico	J. F. Ellis.
	24	do	60,000	60,000	Tennessee	Union Depot	Holston River	Tennessee River	C. A. Steuart.
	24	do	70,000	70,000	do	Fullen's	Nalachucky River	do	Do.
	24	do	70,000	70,000	do	Carter's Depot	Wautaga River	do	John Horan.
			67,353,000	67,003,000					

NOTE.—Since the preparation of these tables a report has been received from Mr. S. G. Worth, from which it appears that instead of the number given as "actually planted" April 12–30, three items should be inserted which aggregate 1,769,500 less. Hence this number should be deducted from the total in the above table. Mr. Worth says: "The only thing received by me was 1,800,000 eggs at 5.30 p. m. April 30. They were estimated on board the Fish Hawk. From these I released on May 1st 700,000 shad fry into Salmon Creek; on May 4th, 200,000 at Moncure, into Haw River, a tributary to the Cape Fear River; and on May 5th, 360,000 into Salmon Creek, making a total of 1,260,000. The other 540,000 eggs were lost in hatching."

After the retirement of the Fish Hawk, however, Mr. Worth, in behalf of the State of North Carolina, took 4,632,000 eggs, from which he hatched out and released 3,485,000 more shad. (See Report of Board of Agriculture, session of 1883, pp. 64, 65.)

TABLE IX.—*Geographical record of distribution of young shad made under the direction of the United States Commissioner of Fish and Fisheries from April 27, 1881, to June 22, 1881.*

Date.		Where fish were hatched.	Number of fish—		Introduction of fish.				Transfer in charge of—
			Started with.	Actually planted.	State.	Town or place.	Stream.	Tributary of—	
June	3	Havre de Grace	1,000,000	1,000,000	Connecticut	Warehouse Point	Connecticut River	Long Island Sound	C. W. Schuermann.
	1	do	1,000,000	940,000	Delaware	Seaford	Nanticoke River	Chesapeake Bay	Do.
May	10	Navy-yard	105,000	105,000	Dist. of Columbia	Washington	Potomac River	do	F. L. Donnelly.
	13	do	100,000	100,000	do	do	do	do	Do.
	25	Potomac barges	1,000,000	1,000,000	Georgia	Macon	Ocmulgee River	Altamaha River	C. W. Schuermann.
June	1	Navy-yard	200,000	200,000	do	Crawfordsville	Oconee River	do	N. Simmons.
	9	do	200,000	200,000	do	do	Little River	Savannah River	H. E. Quinn.
	13	do	100,000	100,000	do	Albany	Flint River	Appalachicola River	N. Simmons.
	18	do	100,000	100,000	do	Montezuma	do	do	F. L. Donnelly.
	18	do	200,000	200,000	do	Milledgeville	Oconee River	Altamaha River	H. E. Quinn.
	24	do	1,140,000	1,106,000	Iowa	Dubuque	Mississippi River	Gulf of Mexico	J. F. Ellis.
	20	do	200,000	200,000	Kansas	Kansas City	Missouri River	Mississippi River	F. N. Clark.
May	18	do	200,000	200,000	Kentucky	Bowling Green	Barren River	Green River	C. A. Steuart.
	24	do	200,000	192,000	do	High Bridge	Kentucky River	Ohio River	Do.
	27	do	200,000	175,000	do	Shepherdsville	Salt River	Rolling River	Do.
June	1	do	200,000	200,000	do	Mumfordsville	Green River	Ohio River	Do.
	15	do	525,000	525,000	Maine	Watervillo	Kennebec River	Atlantic Ocean	J. F. Ellis.
	15	Havre de Grace	625,000	625,000	do	Mattawamkeag	Mattawamkeag River	Penobscot River	Do.
April	27	Potomac barges	234,000	234,000	Maryland	Pamunkey	Potomac River	Chesapeake Bay	M. McDonald.
May	10	Navy-yard	85,000	85,000	do	Cumberland	do	do	J. F. Ellis.
	12	Potomac barges	250,000	250,000	do	Weaverton	do	do	N. Simmons.
	12	Navy-yard	460,000	460,000	do	Laurel	Patuxent River	do	G. G. Davenport.
	12	Steamer Fish Hawk	660,000	660,000	do	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
	13	Navy-yard	260,000	260,000	do	Laurel	Patuxent River	Chesapeake Bay	G. G. Davenport.
	13	Steamer Fish Hawk	1,660,000	1,660,000	do	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
	14	Potomac barges	250,000	250,000	do	Point of Rocks	Potomac River	Chesapeake Bay	N. Simmons.
	14	do	175,000	175,000	do	Relay House	Patapsco River	do	G. G. Davenport.
	14	Steamer Fish Hawk	830,000	830,000	do	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
	15	Navy-yard	300,000	300,000	do	Laurel	Patuxent River	Chesapeake Bay	N. Simmons.
	15	Steamer Fish Hawk	598,000	598,000	do	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
	16	Havre de Grace	4,101,000	4,101,000	do	Battery Island	Susquehanna River	Chesapeake Bay	F. N. Clark.
	16	Steamer Fish Hawk	979,000	979,000	do	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
	17	Havre de Grace	566,000	566,000	do	Battery Island	Susquehanna River	Chesapeake Bay	F. N. Clark.
	18	Steamer Fish Hawk	498,000	498,000	do	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
	18	Havre de Grace	100,000	100,000	do	Battery Island	Susquehanna River	Chesapeake Bay	F. N. Clark.
	19	Steamer Fish Hawk	166,000	166,000	do	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
	20	Navy-yard	150,000	150,000	do	Laurel	Patuxent River	Chesapeake Bay	C. W. Schuermann.
	21	Havre de Grace	260,000	260,000	do	Battery Island	Susquehanna River	do	F. N. Clark.
	21	Potomac barges	1,000,000	1,000,000	do	Denton	Choptank River	do	T. B. Ferguson.

TABLE IX.—*Geographical record of distribution of young shad, &c.*—Continued.

Date.	Where fish were hatched.	Number of fish—		Introduction of fish.				Transfer in charge of—
		Started with.	Actually planted.	State.	Town or place.	Stream.	Tributary of—	
May 23	Steamer Fish Hawk	325,000	325,000	Maryland	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
24	do	313,000	313,000	do	do	do	do	Do.
25	do	275,000	275,000	do	do	do	do	Do.
26	do	406,000	406,000	do	do	do	do	Do.
26	Havre de Grace	48,000	48,000	do	Battery Island	Susquehanna River	Chesapeake Bay	F. N. Clark.
27	do	330,000	330,000	do	do	do	do	Do.
27	Navy-yard	500,000	500,000	do	Laurel	Patuxent River	do	G. H. H. Moore.
27	Steamer Fish Hawk	1,250,000	1,250,000	do	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
28	Havre de Grace	365,000	365,000	do	Battery Island	Susquehanna River	Chesapeake Bay	F. N. Clark.
28	Fort Washington	1,905,000	1,905,000	do	Fort Washington	Potomac River	do	M. McDonald.
28	Steamer Fish Hawk	500,000	500,000	do	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
29	Havre de Grace	825,000	825,000	do	Battery Island	Susquehanna River	Chesapeake Bay	F. N. Clark.
30	do	400,000	400,000	do	do	do	do	Do.
30	Steamer Fish Hawk	1,000,000	1,000,000	do	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
30	Fort Washington	1,096,000	1,096,000	do	Fort Washington	Potomac River	Chesapeake Bay	M. McDonald.
June 1	Havre de Grace	500,000	500,000	do	Battery Island	Susquehanna River	do	F. N. Clark.
2	Navy-yard	150,000	150,000	do	Laurel	Patuxent River	do	W. H. Jenkins, jr.
2	Steamer Fish Hawk	625,500	625,500	do	Havre de Grace	North East River	Susquehanna River	Z. L. Tanner.
4	Navy-yard	120,000	120,000	do	Weaverton	Potomac River	Chesapeake Bay	F. L. Donnelly.
7	Havre de Grace	100,000	100,000	do	Battery Island	Susquehanna River	do	F. N. Clark.
9	do	90,000	90,000	do	do	do	do	Do.
April 12–30	Avoca	3,029,500	3,029,500	North Carolina				S. G. Worth.*
29	do	498,000	498,000	do	Avoca	Salmon Creek	Albemarle Sound	Z. L. Tanner.
30	do	830,000	830,000	do	do	do	do	Do.
May 19	Navy-yard	220,000	1,0 000	Ohio	Defiance	Maumee River	Lake Erie	H. E. Quinn.
27	Potomac barges	1,000,000	850,000	do	Steubenville	Ohio River	Mississippi River	N. Simmons.
17	Havre de Grace	1,000,000	1,000,000	Pennsylvania	Sunbury	Susquehanna River	Chesapeake Bay	J. P. Creveling.
26	do	1,000,000	1,000,000	do	Mifflin	Juniata River	Susquehanna River	Do.
30	do	1,500,000	1,500,000	do	Newport	do	do	Do.
June 3	do	500,000	500,000	Rhode Island	Warren	Palmer's River	Narragansett Bay	H. E. Quinn.
May 17	Navy-yard	200,000	200,000	South Carolina	Charlotte	Catawba River	Wateree River	C. W. Schuermann.
June 1	do	220,000	220,000	do	Railroad Crossing	Pedee River	Atlantic Ocean	H. E. Quinn.
8	do	200,000	200,000	do	Columbia	Congaree River	Santee River	C. J. Huske.
20	do	200,000	200,000	Tennessee	Johnsonville	Tennessee River	Ohio River	N. Simmons.
24	do	60,000	60,000	do	Union Depot	Holston River	Tennessee River	C. A. Steuart.
24	do	70,000	70,000	do	Fullen's	Nolachucky River	do	Do.
24	do	70,000	70,000	do	Carter's Depot	Wautaga River	do	John Horan.
14	do	150,000	135,000	Texas	Railroad Crossing	Sabine River	Gulf of Mexico	G. G. Davenport.
15	do	58,000	56,000	do	Austin	Colorado River	do	G. H. H. Moore.
15	do	32,000	30,000	do	Railroad Crossing	San Marcus River	do	G. G. Davenport.

	15	....do....	28,000	26,000	....do....	....do....	Brazos River	....do....	Do.
	15	....do....	32,000	30,000	....do....	....do....	San Antonio River	....do....	Do.
April	30	Potomac barges	1,383,000	1,383,000	Virginia	Gunston	Potomac River	Chesapeake Bay	M. McDonald.
May	2	....do....	625,000	625,000	....do....	....do....	....do....	....do....	Do.
	5	....do....	1,510,000	1,510,000	....do....	....do....	....do....	....do....	Do.
	6	....do....	1,130,000	1,130,000	....do....	....do....	....do....	....do....	Do.
	7	....do....	230,000	230,000	....do....	....do....	....do....	....do....	Do.
	9	....do....	2,887,000	2,887,000	....do....	....do....	....do....	....do....	Do.
	10	....do....	1,834,000	1,834,000	....do....	....do....	....do....	....do....	Do.
	11	....do....	1,730,000	1,730,000	....do....	....do....	....do....	....do....	Do.
	12	....do....	2,571,000	2,571,000	....do....	....do....	....do....	....do....	Do.
	13	....do....	40,000	40,000	....do....	....do....	....do....	....do....	Do.
	16	....do....	2,585,000	2,585,000	....do....	....do....	....do....	....do....	Do.
	20	....do....	1,125,000	1,125,000	....do....	....do....	....do....	....do....	Do.
	24	....do....	5,490,000	5,490,000	....do....	....do....	....do....	....do....	Do.
	26	....do....	140,000	140,000	....do....	....do....	....do....	....do....	Do.
	31	....do....	1,000,000	1,000,000	....do....	Lynchburg	James River	....do....	J. F. Ellis.
	15	....do....	175,000	175,000	West Virginia	Wheeling	Ohio River	Mississippi River	Do.
			67,353,000	67,003,000					

* For waters in which planted see note at close of Table VIII.

XXVI.—REPORT OF DISTRIBUTION OF CARP, DURING THE SEASON OF 1881-'82, BY THE UNITED STATES FISH COMMISSION.

By Marshall McDonald.

The first applications for German carp were filed in 1876, one year subsequent to the successful importation of this fish and to the establishment of breeding ponds at Druid Hill Park. The total number of applications filed during this year was 3. In 1877 the number increased to 20; in 1878 to 98; and in 1879, when the first distribution was made, the number of applications for the year was 324.

The fragmentary records of this first distribution show that there were distributed directly to 181 applicants 6,203 carp, being an average of 34 to each applicant. In addition there were distributed to State Commissioners and agents of distribution 4,743 carp, making a total distribution for the year of 10,946 carp.

In 1880 the number sent to applicants direct had risen to 31,443, and to State Commissioners and agents 19,021, making a total for the season of 50,464.

In 1881 we were confronted with the problem of distributing 160,000 fish over a much wider geographical range and at a consequent increase in the cost per applicant.

To relieve the messenger service of the pressure of the increased work, and to reduce the cost of the distribution, recourse was had to express shipments in all cases where applicants were willing to defray the increased cost of delivering. The shipping packages first used were wood-bound tin cans, holding about eight gallons of water, and making a shipping package weighing about 65 pounds. The principal lines of express transportation promptly responded to the request of the Commissioner and arranged a tariff of reduced rates of charges to all points reached by their routes. Even at the reduced rates the cost to applicants of express delivery was quite a serious matter, ranging from $1 for the nearest points to $6, $8, $10, and $12 for the more remote. Early in the season, by direction of the Commissioner, a half can was substituted for the can first used. This materially reduced the weight of the shipping package and the express charges in each case. Parties receiving these cans had the option of retaining them at a stipulated price or of returning them. When parties declined taking the cans, they

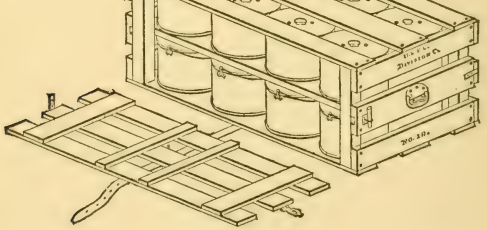
were, under our arrangements with the express companies, returned free.

The distribution made prior to December 15 was accomplished by the methods above indicated; meanwhile experiments were inaugurated looking to reduction both in the weight and bulk of the shipping packages.

An account of the result of these experiments will be found in Vol. I, p. 215, Bulletin of the United States Fish Commission. So satisfactory were they that early in December I was instructed by the Commissioner to take charge of the Division of Distribution, and to inaugurate, systematize, and perfect the more economical methods of distribution rendered practicable by the reduction in the cost, size, and weight of the shipping packages. The standard package adopted was a covered tin bucket having a capacity of 4 quarts. For facility of aeration several holes were punched in the cover of each bucket.

A shipping-tag with room for the address on one side and the requisite printed instructions on the other was devised by Mr. S. C. Brown, so as to inclose securely a blank postal receipt, to be filled and returned by applicant on receipt of the fish. The buckets were to be returned by the applicants in all cases, the cost of the same (20 cents) being added to the express charges, and collected from the express agent in advance.

Where a number of buckets were to be sent to one destination, for convenience in handling and better safety in transmission, light crates were prepared, each having a capacity of 16 buckets, and weighing about 100 pounds. As from their shape several of the crates may be stacked up on each other, it is practicable to pack 1,000 fish on a floor-space not greater than that occupied by two of our ordinary transportation cans. The convenience and economy of these methods of transportation is therefore apparent.



Shipping crate.

All arrangements having been perfected and all necessary material having been collected, express shipments were made in the small buckets instead of the larger tin cans, to all points within a radius of 500

miles from Washington. The weight of the shipping packages was thus reduced from 60 pounds to about 8 pounds, with corresponding reduction in express charges.

At the time I was placed in charge of the work of distribution messenger shipments were in progress in the South Atlantic and Gulf States, portions of Georgia, Alabama, Mississippi, and Tennessee, and all of Florida being at that date (December 15) still unsupplied. The messenger lists necessary to regulate the distribution were at once prepared, and the fish destined for the supply of Southern Georgia and Florida sent forward in charge of Mr. Newton Simmons. Mr. George H. H. Moore and Mr. F. L. Donnelly were then in the field, one in Alabama, the other in Mississippi. They were directed not to return to Washington, but to await instructions at Meridian and Jackson, Miss. To these points messenger lists and explicit instructions and the number of carp necessary to complete the distribution were forwarded by express from Washington. These bucket shipments reached them in excellent condition, and by December 24 the distribution in the sections referred to had been completed. Texas, with 950 applicants, Arkansas, Indian Territory, Western Louisiana, and Missouri, with an aggregate of 150 widely scattered applicants, still remained to be supplied. It was planned to accomplish this work by one movement of our refrigerator car No. 1. All details of the distribution were arranged before we left Washington, the route to be traversed definitely determined, and notices forwarded by mail to each applicant informing him at about what date to expect his fish. So far as practicable, arrangements were made by which each should receive his fish either from the car *en route* or from one of the messengers temporarily detached for the purpose of supplying those remote from the route traversed by the car. It was not thought safe to attempt to carry more than 12,000 fish in the car. It was therefore arranged to have the additional number needed forwarded by express in lots of 2,000. Arrangements were made to have the fish rested and the water changed at Saint Louis. As these methods were novel, and the results considered doubtful by the most experienced messengers, it was thought best that I should accompany the expedition in order to enforce the observance of the necessary conditions of success and to take the responsibility of whatever failure there should be. It was thought prudent to make use of both methods of transportation. The complement of the car was therefore made up as follows: 40 large cans containing each 100 carp; 7 large cans containing each 150 carp; 18 crates containing each 320 carp; 3 crates containing each 400 carp. This made a total of 12,000 fish in the car.

The crew of the car consisted of Mr. J. F. Ellis, messenger in charge; Newton Simmons, George H. H. Moore, M. S. Thompson, messengers; and the cook.

We left Washington at 4 p. m. January 3, 1882, going through to Saint Louis on the fast express of the Pennsylvania Railroad. I did

not think it necessary to examine the fish or change the water until we reached Saint Louis, where all the cans and buckets were overhauled and the water changed except in the crates containing 400 fish each, which were left undisturbed until we reached Texarkana. The fish were all found to be in good condition and the change was made rather as a precaution than as a necessity. At Washington I had placed 100 fish in a 6-quart bucket as an extreme test. At Saint Louis these carp showed signs of suffering and were turned over to Dr. Steedman. From Saint Louis seven buckets of fish were forwarded by express, to applicants in the first Congressional district of Iowa, who had been overlooked in the previous distribution. They reached their destination safely, though two days *en route* and in very severe weather.

On the 5th of January at 9 p. m. the car left Saint Louis by the Iron Mountain route and reached Texarkana the next day. On the way fish were delivered to all applicants in Arkansas who were accessible, postal notifications having been previously sent from Washington directing them when and where to meet us. At Texarkana a complete change of water was made on all the fish. The three crates of 1,200 fish which had not been touched since leaving Washington were found to be in fair condition, though a few were dead and the remainder apparently weak. They had traveled three and a half days without any change of water.

The rise in temperature as we proceeded south made it prudent to take measures looking to refrigeration. Application to the railroad authorities procured a ton of ice, which was placed in the ice-chests, and the refrigerator portion of the car maintained at a temperature of 50° from that time onward until the distribution was completed.

At Texarkana I detached Mr. Moore with a supply of fish for Shreveport, Western Louisiana, and for such applicants in Texas as he could reach conveniently by the route he traveled. Mr. Simmons was sent with a supply for applicants along the narrow-guage road between Texarkana and Waco.

After remaining at Texarkana twenty-four hours in order to rest the fish and to give due notice of our coming, we started Sunday morning, January 8, for Sherman, Tex., delivering fish on the way to all applicants in that section of the State. Moore rejoined the car at Dallas, and Simmons at Fort Worth, while I proceeded from Sherman to the Indian Territory to supply applicants in the Choctaw Nation, and returned via Sherman to Dallas.

Dallas being the point to which the express shipments were to be sent, I had arranged to rendezvous the car and all the messengers there, and thought it best to await the arrival of all the express shipments, as it would be safer to transport the fish south in the car than to trust to their being forwarded by express. The first lot forwarded from Washington came as far as Saint Louis in charge of Messenger Donnelly; there the water was changed, and the fish expressed to Dallas. Donnelly remained at Saint Louis to re-ship subsequent lots, which followed

at intervals of twenty-four hours. These shipments, amounting to about 6,000 fish (scale carp), reached Dallas in fair condition, though they were much weaker than the leather variety brought in the car, and less fitted to endure rough travel.

From Dallas the car with the full complement of messengers proceeded to Austin via Hearne, supplying as arranged all applicants along the route. In order to provide for supplying the numerous applicants in the vicinity of Corsicana it was found necessary to lie over at that place twelve hours, the train agent kindly making arrangements to take us up on the next train. On reaching Austin I was met by Mr. R. R. Robertson, the Texas Fish Commissioner, who was kind enough to take charge of the delivery of carp to applicants in that vicinity. From Austin we proceeded to San Antonio, where I remained, but sent the car on to Laredo. At Laredo Mr. Ellis was detached with enough fish to supply applicants in the extreme south of the State. From San Antonio we returned via the Sunset route to Houston, where I left the car, and with Messenger Thompson proceeded via New Orleans to Washington. I delivered on the way fish to isolated persons who could not be reached in any other way. Meanwhile the car proceeded to Houston and was here joined by Mr. Ellis, who had been instructed from Washington to take the car to Saint Louis and await further orders.

The routes traveled by the car and detached messengers were planned so as to completely reach every part of the State, and the measures taken beforehand to notify applicants were so thorough that of upwards of 800 applicants not more than 7 were unsupplied.

The fish were delivered to the applicants or their authorized agents, or else they were left at the most accessible point and the recipient so notified.

The satisfactory issue of our work is largely due to the liberal facilities accorded us by the various lines of railroad traversed. Anything in the way of supplies or service was unfailingly rendered. Special acknowledgments are due Mr. H. M. Hoxie, the general manager of the Saint Louis, Iron Mountain, and Southern Railway. From Saint Louis westward until our return to that point, free transportation for car was granted on all lines of railroad traversed by us.

The result of the work demonstrated that in making shipments by the car-load we can carry a much greater number of fish by using small buckets instead of cans, and also that buckets can be used with great advantage and economy in shipping by express, provided the passage does not last more than thirty-six or forty-eight hours. I am not satisfied, however, that this mode of shipment is practicable in warm weather. This must be decided by experiments.

The State of Texas seems to possess extraordinary facilities for rearing carp, and as many of the recipients went to great expense to construct ponds it is believed that carp-raising will soon become a flourishing industry in that State.

The following summary of the distribution by States is respectfully submitted:

Summary of carp distribution for the year 1881–'82.

State.	Number of counties represented.	Number of applicants supplied by express.	Number of applicants supplied by messenger.	Total number of applicants supplied.	Total number of fish furnished.	Number of applicants remaining unsupplied.	Total number of applicants.
Alabama	38	28	60	88	1,856	70	158
Arizona	2	.....	.....	.....	.....	7	7
Arkansas	17	5	28	33	818	5	38
California	24	.....	.....	.....	.....	38	38
Colorado	9	1	.....	1	20	18	19
Connecticut	8	21	71	92	2,220	14	106
Dakota	5	.....	.....	.....	.....	8	18
Delaware	3	16	42	58	2,100	1	59
District of Columbia	.....	1	3	4	86	7	11
Florida	11	2	23	25	432	5	30
Georgia	94	30	380	410	7,681	133	543
Idaho	2	.....	.....	.....	.....	2	2
Illinois	62	23	139	162	2,844	24	186
Indiana	52	135	10	145	3,896	27	172
Indian Territory	1	.....	16	16	317	.....	16
Iowa	29	1	15	16	292	28	44
Kansas	45	5	105	110	2,366	17	127
Kentucky	70	7	489	496	9,732	84	580
Louisiana	24	1	51	52	1,276	6	58
Maine	6	6	.....	6	116	5	11
Maryland	28	15	240	255	22,424	9	264
Massachusetts	10	24	3	27	745	21	48
Michigan	20	3	37	40	1,848	9	49
Minnesota	18	4	1	5	100	17	22
Mississippi	55	139	389	528	9,445	97	625
Missouri	50	2	208	210	4,126	54	264
Montana	2	.....	.....	.....	.....	2	2
Nebraska	11	6	1	7	120	8	15
Nevada	2	.....	.....	.....	.....	2	2
New Hampshire	6	6	.....	6	140	5	11
New Jersey	19	49	21	70	1,352	11	81
New Mexico	3	.....	.....	.....	.....	6	6
New York	40	140	50	190	4,616	68	258
North Carolina	56	47	115	162	3,104	91	253
Ohio	62	172	35	207	4,258	89	296
Oregon	13	.....	.....	.....	.....	35	35
Pennsylvania	54	209	141	350	7,256	73	423
Rhode Island	4	5	20	25	1,140	2	27
South Carolina	26	9	236	245	11,884	11	256
Tennessee	46	34	165	199	4,200	55	254
Texas	112	15	926	941	16,580	9	950
Utah	5	5	.....	5	130	5	10
Vermont	3	4	.....	4	76	2	6
Virginia	68	172	304	476	11,669	30	506
Washington	.....	.....	.....	.....	.....	11	11
West Virginia	21	35	41	76	1,935	6	82
Wisconsin	19	10	4	14	296	15	29
Wyoming	1	.....	2	2	200	2	4
Total	1,256	1,387	4,371	5,758	143,696	1,244	7,002

The number actually sent out in 1881 was from six to eight thousand greater than appears from the subjoined table, many having been distributed through agents whose reports were not available when this table was made. There should also be added the number of carp distributed in the spring of 1882, those being of the 1881 crop and amount[illegible] to five or six thousand. The crop of 1881 aggregated about 160,000.

[illegible]ington [illegible]

[illegible] there the w[illegible]

[illegible]nelly remain[illegible]

XXVII.—EXPERIMENTAL INVESTIGATIONS UPON COD HATCHING AT WOOD'S HOLL, MASS., DURING THE WINTER OF 1880-'81.

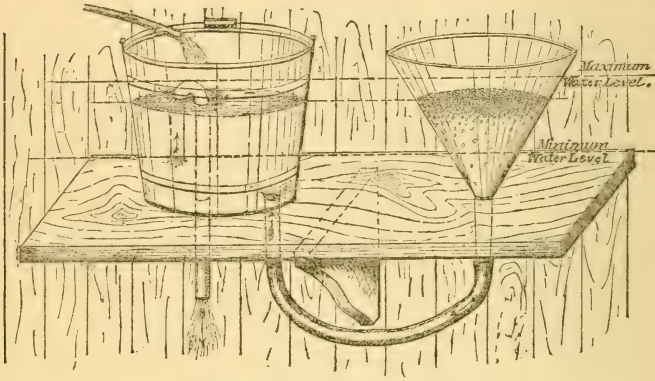
By Marshall McDonald.

In November, 1880, a station was established at Wood's Holl, Mass., with a view of continuing the experiments in cod-hatching which had been conducted at Provincetown the previous winter. Capt. H. C. Chester was in charge of station, which was equipped with engine, pumps, and reservoir for the purpose of securing constant circulation of salt water through hatching apparatus. Having submitted to the Commissioner plans of an apparatus which it was thought would be adapted for the hatching of floating eggs, I was directed by him to proceed to Wood's Holl and conduct the experimental investigations there.

The form of apparatus first proposed was an inverted funnel, the lower end of which dipped below the surface of water contained in the trough, upon which it rested, the supply of water being brought in by a tube at the upper or smaller end of the funnel, so that when once filled with water the column was maintained by the pressure of the air. In this way the movement of the water through the cone, or funnel, was similar to that in the ordinary upright cone used for hatching heavy eggs, except that the current was from above down instead of from below up. It was supposed that the buoyancy of the eggs would counterbalance the downward movement of the current of water, so that the eggs would be kept in suspension in the funnel. This apparatus answered very well for a few days after impregnation of the eggs, when they were much more buoyant than at a subsequent stage. In a short time, however, either by becoming loaded with sediment, or by actual increase of specific gravity, the buoyancy became less and less, and the eggs were carried out and lost. This apparatus, though promising in results on first appearance, proved in practice to be a failure, no eggs whatever having been hatched in it, the several lots used being entirely lost.

As all eggs require constant accessions of fresh water in order to secure development, it was evident that some form of apparatus must be had recourse to in which the water could be continually renewed without carrying off the eggs in its efflux. These eggs being buoyant and occupying a layer at the surface of the water, it was thought that by introducing the water into the lower part of the vessel containing

them and then withdrawing it through the same opening the necessary change of water could be effected. In order, however, to accomplish this alternate influx and efflux of the water conveniently, it was necessary to make use of some automatic device, so that the work could go on without the continual supervision of some expert. The method by which this was effected is shown in the accompanying sketch.



Apparatus for hatching buoyant fish eggs.

In all of the various forms of apparatus that were used at different times during the season, a certain percentage of eggs was hatched, where no accident intervened to terminate the experiment abruptly. The percentage of loss, however, was very large—much larger than could be tolerated in any method where practical results in hatching were to be looked for. These losses were to be attributed mainly to two causes: the increase in the density of the eggs as incubation went on by the accumulation of sediment, and the inferior density of the water employed as compared with sea water. Could these methods have been used where water of the density of the sea was available, and where perfect means of filtration could be provided, I have no doubt but that all the forms of apparatus used would have given good results in hatching.

The largest percentage of hatching was attained in the upright glass funnels, in which the eggs, twice a day, were thoroughly washed by a jet of water, the effect being, by the attrition of the eggs upon each other, to keep the surfaces perfectly clean and to maintain their buoyancy. The percentage of hatching in the majority of the cases was very small, not more than from 5 per cent. to 15 per cent. of the total number of eggs employed. In one experiment with a glass funnel, containing 40,000 eggs, the water in which, from its location near the stove, was uniformly several degrees higher in temperature than the water in the

hatchery, 25,000 young fish were obtained. These were sent in charge of special messenger to Annapolis and deposited in the Chesapeake Bay at that point.

The range of the investigation at Wood's Holl was largely limited from the fact that we were able to obtain during the time that I was there, only a single lot of spawning fish, from which, though some millions of eggs were secured, the larger part were lost, and we obtained only some four or five thousand fry. The succession of spawning fish that we had hoped for was not obtained, the extreme cold weather having prevented it. The station was accordingly abandoned, and the experiments discontinued before the appearance of the schools in Ipswich Bay. Had the station been kept open, and the supplies of eggs obtained, which would have been available from this source, I have no doubt the result of the winter's work would have been to establish precise methods and forms of apparatus for the hatching of the cod egg on a large scale.

In connection with this work important investigations were conducted by Professor Ryder in regard to the embryology of the cod-fish. Results of these investigations have already been communicated in detail by him to the Commissioner.

XXVIII.—SPANISH MACKEREL—INVESTIGATIONS AT CHERRYSTONE, VA., DURING THE SUMMER OF 1881.

By Marshall McDonald.

The Spanish mackerel is the most valuable species of the salt-water fish taken in the Chesapeake Bay. It enters the capes in large schools about the 1st of June, each year, and is found in the bay during the whole summer, being taken in large quantities by the pounds on the eastern shores of Virginia, and at New Point, on the western shore, and in the middle ground of the Chesapeake, off Tangier Island, by gill-net fishermen. Until the investigations of Col. M. McDonald and Mr. R. E. Earll, which were conducted at New Point during the summer of 1880, it was not known that this species spawned in the Chesapeake. As soon as the fact was announced to the Commissioner he, appreciating the importance of the discovery, later in the season sent Mr. R. E. Earll to the vicinity of Crisfield, Md., with suitable apparatus to determine the possibility of obtaining eggs in large numbers, and to study the methods and apparatus of hatching adapted to them. Mr. Earll was able to report, as the result of his investigation, that the eggs could be obtained in vast quantities, and could be hatched readily by methods requiring little apparatus or attention on the part of the observer. The result of Mr. Earll's investigations, and of cotemporaneous investigations conducted upon the western shore by the steamer Lookout, have already appeared in the official publications of the Fish Commission.

The following season (1881) it was determined to see what could be done in the way of the artificial propagation of this species on a large scale. Accordingly, after the close of the shad hatching, the steamer Fish Hawk, in charge of Lieut. Z. L. Tanner, was sent to Cherrystone, on the eastern shore of Virginia, to establish a station there; Cherrystone being selected on account of its convenience to the large pounds on the bay shore between that point and Cape Charles, in which the larger proportion of the catch of Spanish mackerel in the Chesapeake Bay is taken. It being necessary to detach the Fish Hawk for summer work along the coast, I proceeded, by the direction of the Commissioner, to Cherrystone, in July, 1881, with instructions to establish there a shore station, and to continue the study of methods and apparatus as long as material for the purpose could be obtained.

The embryological investigations were conducted by Professor Ryder. Messrs. Sauerhoff and Walke, two of the most experienced fish-culturists connected with the work of the Commission, were detailed for service at the station. A Herreshoff launch furnished convenient means for the collection and transportation of the eggs from the pound nets to the hatching station. The methods and apparatus employed here were, in the main, those that had been used in the experiments in cod hatching the previous winter at Wood's Holl. Fair results were obtained in the use of nearly all the forms of apparatus employed. The great drawback, however, to the station was the inability to obtain eggs in sufficient numbers for the purpose of hatching. Of course, large numbers of Spanish mackerel were taken in the pounds. It was found, however, much to our surprise, that the fish were either spent or in various degrees of immaturity. Only in two or three instances were we able to secure full-ripe fish. This is probably to be attributed to the fact that the pounds are mainly fished on the first low water in the morning. The mackerel, when unrestrained, probably spawns early in the evening. Ripe fish, therefore, taken in pound and kept confined all night, crowded and worried by other fish, would spend their eggs during the night.

If Cherrystone is, therefore, to be made a center for fish-cultural operations connected with the Spanish mackerel it will be necessary to adopt means for securing the fish independent of the pounds now fished on that shore. A pound net owned and operated by the Commission, so that it could be fished whenever and as often as convenient, would probably give large results in the way of eggs.

In August, disappointed at the promise of eggs, which we had so confidently looked for at Cherrystone, I made a visit to Tangier Island and Crisfield by one of the "run" boats carrying fish from the eastern shore of Virginia to Crisfield. At this place I had opportunity to inspect the mackerel boats fishing off Tangier Island, all of which run to Crisfield with their fish in the morning after a night's fishing. In a single one of these boats, containing 200 or 300 mackerel, I found 52 full-ripe female fish, which would have yielded over 5,000,000 eggs, a number larger by far than we obtained from the pounds near Cherrystone during the entire season.

Inquiry at Crisfield of the fishermen handling the Spanish mackerel showed that the ripe fish in largest numbers make their appearance in the markets there from the middle of June to the first of July, which seems to be the height of the spawning season. Indeed, it is probable that the natural spawning grounds of the mackerel are much higher up the bay than Cherrystone. All indications would seem to point to the middle ground off Tangier Island as their breeding place. If in the future it be decided to develop the work of the artificial propagation of the mackerel, I should recommend the establishment of a station at or in the vicinity of Tangier Island and the erection of a pound by the Commission, to be operated by its own men, for the purpose of

securing a supply of eggs. I have no doubt but that eggs in any quantity desirable may be obtained in this manner. While the practical results of Cherrystone Station were negative, yet the investigations conducted by Professor Ryder in regard to the embryology of various species of fish taken there were of surpassing interest. Full reports of these have already been submitted by Professor Ryder and published in the official reports of the Commission.

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